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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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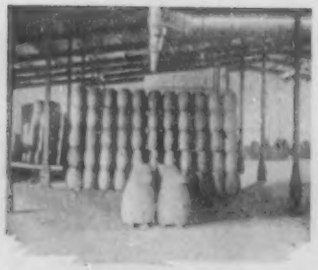

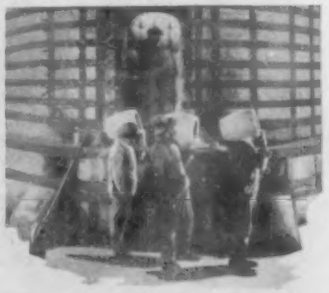

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THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD, COPPER AND BRASS, THE BRASS FOUNDER AND FINISHER AND
ELECTRO-PLATERS REVIEW

Vol. 18 NEW YORK, APRIL, 1920 No. 4

The Manufacture of a Brass Faucet or Compression Bibb Cock

A Complete Description of the Various Steps Taken, from the Ingot to the Finished Product.

Written for The Metal Industry by PETER W. BLAIR, Mechanical Editor

The brass faucet or compression bibb cock, which is in use in every kitchen, though it be ever so humble, shines in some of them with great lustre, as the up-to-date housekeeper takes great pride in her hot and cold water faucets installed at the kitchen sink.

A brass faucet, to stand the wear and tear it is subjected to in every day use all the year around, must have a large percentage of copper. The different manufacturers advertise their products with the amount of copper they contain, and I often wonder who will be the first manufacturer to advertise that his faucets are of special bronze tempered in the same manner as that used in prehistoric times. The famous mixture of antiquity known as Corinthian bronze was made of 90 parts of copper and 10 parts of tin. It is interesting to note that for many years the standard Government specifications for valves and faucets has been 88 parts copper, 10 parts tin and 2 parts zinc, familiarly known as 88-10-2.

A number of manufacturers had a hard proposition on their hands when they secured some of the large Government contracts that were allotted, and specifications called for this alloy. Also when most manufacturers of brass faucets say that they use only copper, tin, a small portion of zinc and not a particle of lead in making the faucet they are mistaken because unless zinc is superrefined it carries more or less lead. In order to make a casting for brass faucets that will have the desired tensile strength, be free from blowholes and that can be machined at a normal cost, a mixture of copper, tin, zinc and lead is necessary. Tin is just as important as the copper, and the lead and zinc reduce the cost of both of the castings and the machining. To secure sound and solid castings, a certain percentage of tin must be used and no substitute has been developed in the brass foundry to take its place.

There are some very curious and interesting things in connection with the mixing of different metals to form compositions. The slightest variations in the proportions of the metals or the most minute quantity of some foreign metal not supposed to be there will cause one the most astonishment, when the casting is produced and sometimes not until the machining, polishing, buffing and nickel plating operations have been performed does it develop. The composition or mixture must not be too hard or too soft, too brittle or too ductile; it must have sufficient density, tensile strength, and above all must be capable of being machined, by automatic machines. Many brass foundries of today where bronze steam metal faucets and a general line of plumbing and steam brass goods are made, use furnaces in which the different metals are melted by means of oil or gas under forced draft. As a result what goes into these furnaces is not always there when the molten metal is ready to pour, some of the elements having already gone up the chimney, or out of the spout of the furnace. The Government department allows a certain percentage of variation away from the specifications of their several compositions, whereas in the olden times of the crucible, they were not so liberal, because formerly when 88-10-2 went in 88-10-2 was expected to come out.

Copper alloyed with tin or zinc in certain proportions is strengthened. Hardness varies in metal quite as much as the tenacity and both are greatly influenced by very slight changes, either physical or chemical. The addition to an alloy of scarcely more than a trace of impurity often produces a marked change in the hardness. The special qualities of the useful metals which give them

STANDARD COMPRESSION FAUCET.

HIGH GRADE COMPRESSION FAUCET.

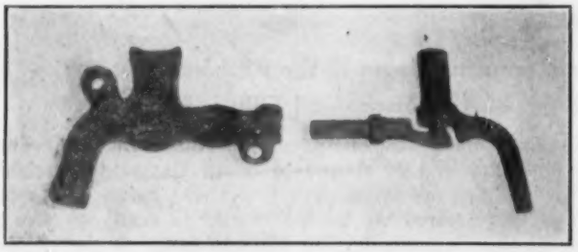
their importance are strength, hardness, density, ductility, malleability, fusibility, and lustre. And lustre or color is one of the main points. There is not a manufacturer of high grade brass faucets or compression bibbs who does not give great consideration to the color, and make sure that it is a nice golden red, as there are so many people and dealers who are impressed with the idea that they can tell by its appearance when a faucet has too much lead or not enough copper.

When the small shop or manufacturer flourished, the brass faucet was made in one dozen lots, and the one workman did the complete faucet including the machining, polishing and buffing. In these days of quantity production however the routine is all changed. The first thing that is made is a drawing. The draftsman must determine the general outline of the parts and must be guided by his past experience in the foundry and finishing shop. Not only must a brass faucet be a real piece

of first class work, but it must present a pleasing appearance, both as to finish and shape.

Parts of brass faucets are relatively small and on this account extra accuracy is necessary if the faucet is to be satisfactory at the testing and inspecting bench. This accuracy can only be secured in one way and that is by the proper use of gauges. Gauges as a rule travel in pairs, one gauge called "go" and the other "no go." These two gauges differ by what is known as the "tolerance." This tolerance is expressed in thousandths of an inch. Every part which proceeds to the assembling must go into the go gauge and not go into the no go gauge. After the designer has finished with his part of the work his drawings proceed to the pattern shop and tool room.

The pattern maker uses wood, white metal which does not shrink, brass and iron, also plaster of paris until



COMPRESSION BIBB COCK CORE AND CORE DRYER.

there is finally evolved a pattern and core box. The pattern is exactly in the shape of the outside of the part and the core box is exactly the shape of the inside of the part. The difference between the pattern and the core represents the part, or casting. Wherever the part is symmetrical about a given axis only half a pattern is used. In general practice this half pattern is mounted on a plate. An iron frame with neither a top nor bottom is placed on this plate, filled with sand, turned over and the plate lifted off. This gives a clear impression of the pattern. If this is repeated the two halves turned face to face, a mold has been made. But before doing so ways and means must be provided for leaving the passage for the fluid or water through the faucet. This is done by means of a core.

This core is made principally from sand, having been packed into a core box of two halves. The main ingredients of the core are sand, oil, rosin, and wire. It is shaped like the inside of a faucet. Great care is used by some of the manufacturers to produce nice core work in the castings, so that there will be no fins or sand burnt into the metal to allow a clear passage way for the fluid. As the body of a compression bibb faucet core is rather fragile, before baking or removing cores from the box in their green state core dryers are used. The cores are then baked in an oven at a temperature ranging from 350 to 500 degrees. They are then cleaned, inspected, all fins removed, racked and ready for the moulder to use.

The moulder having now made a half mould which is going to the bottom half or drag, which takes the core, then makes the upper half or cope, which he puts on top.

The mould is now ready for the metal and in some plants it is melted in pit furnaces, in crucibles with forced draft; in others it is melted in direct fired furnaces using oil or gas, which means that the metal is charged into the furnace and has projected into it or directly over it a gas or oil flame. Still another method that has come into vogue is the melting in an electric furnace.

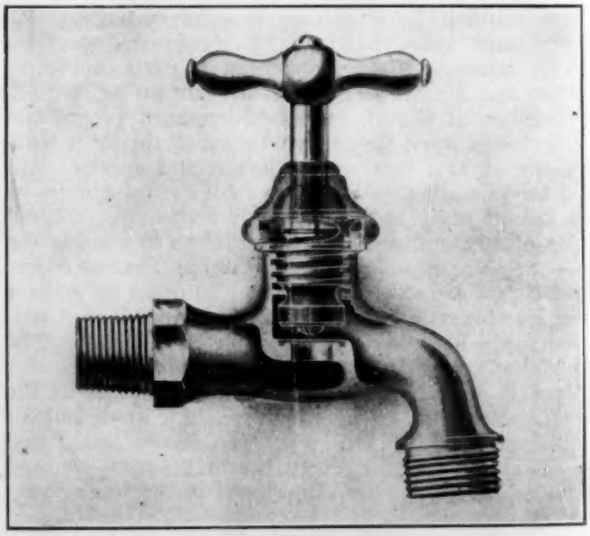
The other parts of the faucet, the spindle cap and handle are run through the foundry along the same lines and the same methods used.

The next step is the machining of these castings, so that a good serviceable faucet, inside and out, can be produced. The actual processes of the machining and the equipment to be used depend entirely on the quantity to be produced. If large quantities are to be produced it is a good investment to equip with modern tools and semi-automatic machines. The seating operation is the most important part in a compression faucet, as the entire wear and tear is placed on that part. A perfect seat with the correct radius on top should be produced. The majority of manufacturers produce a round seat on top, although a flat seat with round edge on outside is much to be preferred as more service can be obtained from the flat seat on top. When care is taken in the machining operations and the parts are true to the gauges the assembling is facilitated.

The work then travels to the polishing department to have the rough surface removed by a process of polishing by wheels coated with emery number 80 and 120, run at a high speed where much care is bestowed upon it for the removal of all marks.

The bodies then meet the other component parts that enter into making a complete faucet in the assembly room, where they are screwed together. If they accumulate at the assembly benches, however, here a pile of stems and yonder a pile of bonnets that do not go together, then the work has been done poorly. The gauges have to be applied and the mistakes discovered.

They are then passed on to the testing and inspection bench, where they are subjected to a rigid inspection and tested at 200 lbs. hydraulic pressure, stacked up on trays where no piece comes in contact with the other. They are then buffed, and in the majority of cases nickel-plated, where they take on the attractive appearance of a finished article.



HIGH GRADE COMPRESSION T-HANDLE FAUCET.

The next problem is to keep them from injury by rubbing against the others, and to preserve their appearance on the jobbers' shelves.

They are wrapped individually in tissue paper and then in brown paper, packed in cartons, square cardboard boxes, and labeled with a printed label of a conspicuous hue showing what they are. After the packing and boxing they are ready for shipment, to be used and sometimes abused by the plumbers or owner into whose hands they arrive.

The Casting of Nickel Brass

A Problem in the Manufacture of Small Flanged Bushings

Written for The Metal Industry by W. J. REARDON, Foundry Editor

Recently a problem came up in the production of nickel brass (also known as nickel silver, German silver or Liberty silver) castings of a mixture

47.5	copper
25	zinc
22	nickel
2	tin
3	lead

The castings were to be bushings 1½" O.D., 1" core, 2" long, with flange in center to be cut off in two bushings. There had been difficulty with regard to pouring temperatures, gating and mixing. Also the foundry that had been doing this work had had trouble with dross around the gate running into the castings and small blow or gas holes throughout the castings. Recommendations for overcoming these difficulties were as follows:

First—The mixture is not of the best. However, if this mixture must be used, add 2 lbs. aluminum. To cast successfully in sand, aluminum is necessary as a flux.

Second—The gating should be done as per sketch, using a skim gate.

Third—As ingot metal is used, all that will be necessary is to keep the metal covered with charcoal and stir well. Add the aluminum five minutes before pouring.

Fourth—Pour at approximately 2000 to 2100 degrees. Fahr.

Fifth—Use No. 2 Albany sand or some open grade.

Sixth—Use a core mixture of open sand, using glutrine as a binder.

Seventh—Ram the drag half firmly and the cope rather soft, using 4" cope in flask. Be sure the gate and riser are as per sketch, and there should be no trouble with dross or blow holes.

There was a second question. The foundry had a quantity of metal—85 copper, 5 tin, 9 lead and 1 zinc—which they wished to use up as follows:

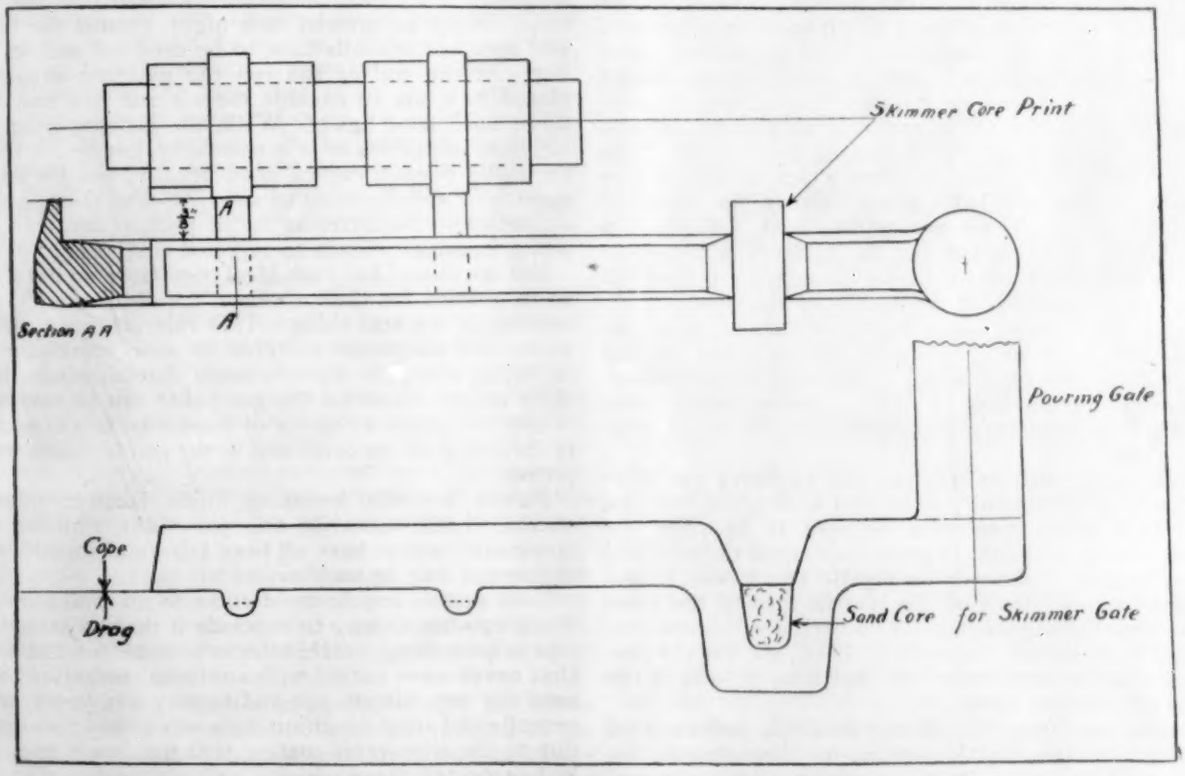
100 lbs. of this mixture.
25 lbs. lead.
5 lbs. German silver (nickel brass.)

They asked what the wearing qualities of such a formula in water meter work would be; also how it would machine and whether it would segregate.

Such a mixture would be, approximately,

65.38	copper
26.20	lead
3.85	tin
.75	zinc
3.85	nickel silver

This would be similar to plastic bronze, a bearing metal. It could not be recommended for meter work. It will machine nicely, but if the user is not familiar with handling this metal it will segregate.



SKETCH SHOWING GATING OF CASTING FOR BUSHINGS.

A New Nickel Alloy

The resistance of nickel to the corrosive attack of acids is sensibly increased by the addition of a small amount of tantalum. The proportion of the rare metal which it is possible to add is ordinarily 5 to 10 per cent. An alloy of nickel with 5 per cent of tantalum can be treated with aqua regia without suffering any alteration.

The alloy possesses great tenacity, is easy to roll, may be forged and wire-drawn. This alloy can be heated in air to a high temperature without oxidation.

Revista Minera, Metallurgica Y De Ingeniera, Feb. 1920, Vol. 71, No. 2728, p. 75. By R. E. SEARCH, Metallurgist.

Coatings for Metal Patterns

The Protection of Metal Patterns by Artificial Means

Written for The Metal Industry by WILLIAM H. PARRY, Expert Pattern-Maker

It would seem that patterns made of iron, brass, white metal or aluminum if properly finished would not need any coating to protect them from the action of the damp molding sand and the sometimes very damp pattern storage vaults, but a coating of some kind is frequently necessary to counteract these destructive agents, which by the way are not the most destructive.

There is no condition that could possibly be worse for their health than to have them lie around the foundry itself for any length of time when they are not actually in use, as they are then subjected to the action of all the gases including steam, smoke and furnace fumes to say nothing of particles of sand which when mixed with the above mentioned vapors build a coating on the patterns that makes them as smooth as sand paper, and eats into their surface.

For iron patterns the cheapest and very often the best coating is the one that nature provides, in the shape of iron oxide or rust, which is often stimulated by the exceedingly scientific method of dashing water on the heated surfaces repeatedly until a dense coating results, always bearing in mind that a frequent rubbing of said surfaces is required to prevent pitting. Many foundrymen have a leaning toward the "gun barrel finish" for iron patterns which comes in two colors, brown and blue, procurable at the chemical supply houses. These are applied with a cloth or a brush and baked on, keeping the patterns in the ovens at a temperature not to exceed 165 degrees F., and for a period of from ten to twenty hours' duration.

Very thin baking japan has been used on iron patterns and, if evenly distributed makes a fair coating on patterns where accuracy is the least consideration, but as the very nature of a japan coating means some appreciable thickness, it follows that it is not generally used.

The waxes such as beeswax and bayberry (or myrtle) wax are frequently used, and with great success, the latter being preferable because it has not the stickiness of beeswax, is more fluid, runs thinner, and lasts longer. Bayberry or myrtle berry wax is obtained from the fruit of the Myrica species, the trees producing them growing everywhere the English language is dominant. It melts at 45° C. so that the patterns must be kept out of the hot sun, at least in the good old summer time.

Varnishes of any kind do not as a rule make a good coating for any metal pattern, as they depend for their holding power on the porosity of the material coated. We know of course that almost all materials are porous, but we also know that the relative porosity that the woods used in pattern making bear to the metals used in the same art, favor the varnishes as coatings for wood patterns only. Varnishes, no matter how or when applied to the metal pattern will eventually flake off, leaving the pattern much worse off than if they had not been coated at all. If the flaking process is thorough the patterns would be entirely naked, and ready for another suit of clothes, but the corners and pockets where the metal pattern is not finished as well as it might be, are where the varnish will sometimes cling, and if repeated coats are applied, the poor old pattern will present a most awful surface to the sand.

Mention must be made here of a coating that is sometimes applied to metal patterns, but only once in the lifetime of the sweet young thing who makes the discovery that has escaped all of his predecessors, namely that of graphite, silver lead, black lead, plumbago (call it what you like.) This wonderful lubricant becomes a paste when the damp sand lays its loving cheek against it, as many a discoverer has found out to his discomfort. I just mention this in passing so that those who are patient enough to read this will not fall for it.

Coating brass or white metal patterns is something to be approached with fear and trepidation, as so much depends on the conditions existing in the plants where these instruments of Satan mostly congregate. We must first determine whether there is any necessity to coat them at all, and I would say right off the bat that if conditions were ideal, no coating whatever would be needed. By ideal conditions, I mean that the patterns should be covered each night, even if the molders' apron or overalls have to be used for such covering. At the end of the run the patterns should be placed in a box to exclude the air and dirt and kept there until used again. While the pattern is in use, constant inspection of it is necessary, not by the molder, as he doesn't care a hoot usually, but by an inspector or sub-foreman to see that sand doesn't build up between the lettering or in pockets and corners, which eventually leads to rejected castings.

But we know that such ideal conditions do not exist, so to provide for their absence, the old bayberry wax coating is the real thing. This rule applies to white metal and aluminum patterns as well, especially the latter, as when the claim is made that aluminum is of light weight about all the good that can be said of it is said. Without a coating of some kind it is constantly throwing off its oxide and in the end becomes badly pitted.

Paints, enamels, bronzing fluids, lacquer, mineral waxes, (both ozokerite and paraffine), Chinese and spermaceti waxes have all been tried and found wanting in one way or another.

Now as this article must come to an end, I do not know any better way to conclude it than to state that I have seen many metal patterns both of iron and brass that never were coated with anything, and after being used for ten, fifteen, yes and twenty-five years, were actually in better condition than when they were new, due to the wonderful coating that use, wear and care had protected them with.

Covering Canvas with Emery

Question: We are interested to know the best method of gluing and coating canvas with emery, and leather straps for strapping machine. Our straps are 4″ wide and 10′ long.

Answer: One of the first requirements is to see that you are using a glue of good adhesive qualities as otherwise the grains of abrasive will be easily torn off and wasted. Also, a glue that is too hard or brittle will break or crack and allow the grains to be torn off. After glue is applied when the belt or strap is stretched tight, the emery must be then applied by sprinkling on, then rolled into the straps with a double roller and pressure applied with the wheels revolving by hand.—P. W. B.

British Aluminum Foundry Practice

An Exposition of the Methods of Handling Aluminum in the Foundry From the Ingot to the Finished Product. Part I*

METHODS OF CASTING.

Casting may be roughly divided into two main types, that using sand molds, which are destroyed when the casting is removed, and that employing metal molds, which are used over and over again. The latter class of casting may again be subdivided into two groups, namely, that in which the metal flows into the mold slowly under its own weight and that in which the metal is subjected to some form of additional pressure either before or after entering the mold. The first of these subdivisions is generally known as chill casting, whilst the latter is rightly called die casting.

The line of demarcation between these is not strongly defined, for a casting poured in the ordinary way in a metal mold may be subjected to a very appreciable additional pressure by allowing a sufficient head of metal in the risers, and such a casting might, for that reason, justifiably be called a die casting. It is not astonishing, therefore, to find that there is some confusion between the terms, and that the name die casting is frequently applied to a class of work that could not rightly be called anything but chill casting. In this pamphlet die casting is taken in its strict sense to be the process in which some external form of pressure is applied to the metal in the mold, either by means of air pressure, mechanical pressure, or other such means.

ALLOYS FOR SAND CASTINGS.

Pure aluminum is not usually employed for castings subjected to stress, owing to its comparative softness and lack of strength. Pure aluminum in the cast state has a tensile strength of only some 5 tons per sq. in., with a very high elongation. For such purposes as cast cooking utensils, however, where tensile strength is of less importance than resistance to corrosion, pure aluminum is employed, although in some cases a very small percentage of manganese (about 0.2 per cent) is added to facilitate casting.

In order to raise the tensile strength and increase the hardness, it is usual to add small percentages of some hardening metal, such as zinc, copper, nickel, etc., the amount and nature of the added metals depending upon the physical and mechanical properties desired.

In general, any increase in tensile strength and hardness obtained by the addition of alloying metals is at the expense of ductility in the cast state, and where such castings are subjected to shock it is not advisable to increase the hardening effect beyond a certain point.

It must also be borne in mind that practically all of the common metals employed as alloying media are heavier than aluminum, and that the addition of such metals increases the specific gravity. It is difficult accurately to forecast the specific gravity of any alloy from the percentages and specific gravities of its constituents, though a figure so calculated gives in general an approximation to the truth. The real specific gravity can only be found by test, and the method employed by some firms for checking their mixes by taking the specific gravity of each mix, can only be correct if referred to a table of specific gravities based on actual tests and analyses.

With the metals commonly used for alloying with aluminum, the tensile strength at first rises fairly rapidly with increased percentage of added metal, but beyond a certain point the increase of strength is small, while the brittleness increases rapidly until towards the other end of the series the properties again become valuable.

It will be obvious, therefore, that beyond a certain point the increase in strength is not in proportion to the increase in weight, and from a strength for weight point of view it is more profitable to keep within fairly narrow limits.

There are two main classes of aluminum casting alloys: those containing zinc as their principal hardening medium (either with or without the addition of small quantities of other metals) and those containing copper as their principal hardening medium. There are points in favor of each, but up to recent years the aluminum-zinc series of alloys have been mostly favored in this country for general work, while in America and France the copper series of alloys have been more popular.

Zinc, in normal times, is the cheapest known hardener of aluminum, and can be added in quantities up to 30 per cent, there being an actual improvement in mechanical properties up to about 15 per cent. Zinc alloys are cheap, melt at a low temperature, are easy to cast and are not very brittle up to about 20 per cent of zinc. They do not machine well, however, though the machining qualities may be appreciably improved by the addition of 2-3 per cent of copper, and they are useless for withstanding hydraulic pressure, as they are inclined to be porous.

Aluminum-zinc alloys also have the reputation of being particularly subject to fatigue, though this is not borne out by tests made on special alloys, and is probably due to impurities in the zinc rather than in the nature of the alloy. Lead is particularly deleterious to any aluminium alloy, and when making zinc alloys for castings to pass stringent tests, only high grade spelter free from lead should be used.

For high-class work, especially for castings to withstand pressure—such as cylinders and pistons of motor car and aeroplane engines, etc.—aluminum copper alloys are now usually preferred because of their higher strength to weight ratio, their greater resistance to shock, and the fact that they are less porous under hydraulic pressure.

Owing to the higher melting temperature of copper, greater care is required in making up the alloy to avoid burning, while the higher melting temperature and lower fluidity of the molten metal as compared with zinc alloys makes them more difficult to cast.

The presence of copper up to about 10 per cent improves the mechanical properties considerably, though beyond 8 per cent the gain is not proportional to the increase in weight. For ordinary purposes up to 6 per cent of copper, either with or without a small percentage of zinc, will be found to give the best results. When cast in sand molds an ultimate tensile strength of 8-9 tons per sq. inch should be obtainable, with a yield point of 5-6 tons per sq. inch, and an elongation of 5-8 per cent on 2 inches.

From the point of view of resistance to fatigue an excellent alloy is 92 per cent aluminum, 7 per cent copper, and 1 per cent of tin.

*From Aluminium Foundry Practice, a booklet published by the British Aluminium Company, Limited, London, England.

For special purposes where extreme stiffness or hardness is required, up to 12 per cent of copper may be added, but beyond 15 per cent the alloy becomes brittle and the tensile strength begins to fall.

In making up copper alloys it is best to add copper in the form of a standard mixing alloy containing 25 per cent of copper and 75 per cent of aluminium.

Where good machining qualities are desired, aluminium-nickel alloys are frequently employed. Nickel behaves like copper, though the useful range of alloys is more restricted and nickel alloys are not so easy to cast. As a rule, copper is added as well as nickel, a useful alloy being 2-3 per cent of copper and 5 per cent of nickel. Alloys containing more than about 25 per cent of nickel rapidly disintegrate.

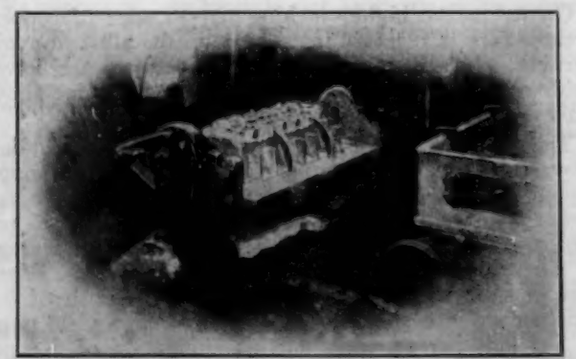
Manganese alloys are interesting in that their tensile strength increases with an increase of temperature up to 250° C.

DESIGN AND PATTERN MAKING.

When designing and making patterns for casting aluminum it must be remembered that the metal shrinks 13/64 in. per foot, and sufficient margin must be allowed both on the patterns and core boxes. Thin sections and complicated coring should be avoided as far as possible, for the metal is exceedingly fragile at temperatures slightly below the solidification point, and the slightest strain may result in a crack.

The casting should be designed so that the thickness variations are as small as possible, and sharp changes in direction do not occur. The production of castings which utilize to the greatest extent the many advantages that aluminum possesses is often made impossible by careless designing, and the reason for a failure can more often be traced to the designer than to the lack of knowledge of the foundrymen who did the work. Where changes of section or direction are unavoidable, ample fillets should be provided, for a sharp angle tends towards the formation of a definite line of crystallization, which is a source of weakness. The sharper the angle or the greater the difference in thickness, the larger should be the radius of the fillet. On the other hand, the radius should not be too large, for often when fillets have been introduced to give soundness and to avoid sharp alteration in form, they serve rather to give extra thickness and to provide space for shrinkage holes.

Corework is a further direction in which the difficulties of the molder may be reduced by the designer. Cores should be avoided wherever possible, and when cores cannot be eliminated altogether, it is generally possible for the pattern to be so designed that a green-sand core may be used, or at least a green-sand half.



FIRST STAGE IN THE MOULDING OF THE LIBERTY AERO ENGINE CRANK CASE.

Pattern in place on roll-over jolt-ram moulding machine. Note the shape of the horn gates, which are made to a perfect radius so that they can be slipped easily from the completed mould on a curved path. (By Cleveland Osborn Manufacturing Company.)

MOLDING.

The principles governing molding for aluminum castings, while broadly the same as for brass, are different in certain respects. Owing to the low density of aluminum, the gases generated during molding may escape through the molten metal itself rather than through the sand, unless the latter is extremely porous, and a bad casting containing a mass of blow holes will result. Porosity is therefore one of the chief characteristics of a successful mold for aluminum.

The necessary porosity could be obtained by the use of dry sand, but this introduces the further difficulty that fractures may result, owing to the high shrinkage of the metal and the unyielding inflexibility of a dry-sand mold. The best practice is the use of green sand, which should be lightly but evenly rammed. The ramming, indeed, is one of the principal differences between the methods of casting aluminum and those of casting other metals. The specific gravity of aluminum being low and the head pressure practically negligible, the mold need not be rammed so hard as with brass or iron, in order to retain the shape of the pattern without "swells" or other troubles. The lighter ramming will provide the necessary porosity and flexibility, and, in consequence, the temper or the dampness of the sand itself may be much the same as for other non-ferrous metals, except that the sand should be close-grained to provide a smooth surface.

The ramming must be particularly even, and the rammer must be kept away from the pattern if the mold is hand made. For the best method of ramming, however, is by means of the jolt-ram machine, of which there is a large and varied selection on the market. The action of this machine is particularly favorable for the production of molds for aluminum costing, because the sand as it is filled into the mold is in an aerated condition, and, as it sinks under the influence of the jolt, the air forces its way out and automatically provides passages for the escape of the molding gases. Moreover, by timing the number of jolts, almost any degree of hardness may be obtained, with the certainty that the mold is being rammed evenly.

The mold having been made with the desired grade of sand, it may be dusted with French chalk or licopodium powder. Plumbago and other black sleeking should not be used if a clean white surface is required.

CORES.

Cores for aluminum must be so constructed that they will crush easily, and no resistance is offered to the shrinking of the casting, or strains will be set up which invariably break the metal. The cores must therefore be as light as it is possible to make them, and yet be strong enough to hold together when handled.

A great variety of sands and binders are employed, and it is not unusual to find at least three core mixtures in use at the same foundry. An oil sand mixture is sometimes used for small and intricate cores, and mixtures containing resin, flour, or treacle for the larger cores. A resin binder is particularly good, since it softens immediately by the heat and the core crushes readily. Such cores are easily knocked out if the castings are taken from the molds hot and cleaned at once, but if they are allowed to cool the resin cores harden once more and it is almost impossible to get them out.

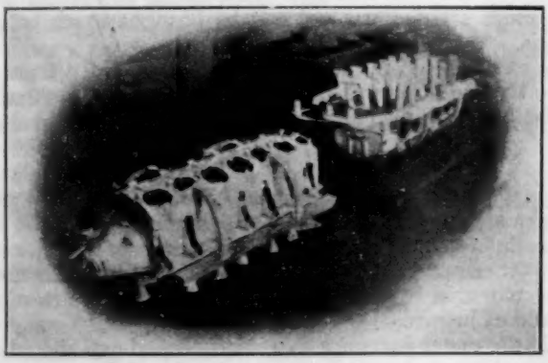
Large cores within thin walls of metal are a source of considerable trouble, since a large core which is strong enough to be handled would have far too high a compressive strength to be crushed before the metal cracks. Such points must always be borne in mind by the designing engineer.

GATING.

The influence on the quality of the casting of the size, shape, and position of the various gates, risers, and runners in a mold is very large, and this is particularly so for aluminum. A gate can be so constructed as to menace any casting it will run, and experience has shown that at least 30 per cent of the causes of failure when casting any of the non-ferrous metals is due to badly conceived gating. The subject is worthy of a textbook to itself, and cannot be dealt with here in any detail. The principles involved are not different with aluminum than with any other metal, but the hot shortness and high shrinkage of this metal, coupled with its low density, make it imperative that these principles be most carefully observed. Though illogical gating may, in certain cases produce fair castings with other metals, none but the most carefully considered gating may be relied upon to produce sound castings in aluminum.

Aluminum must be poured rapidly, and it is therefore advisable to have even larger gates than for brass or gunmetal. The size of the gate depends upon the shape and size of the casting, the distance from the gate entrance to the extreme point of the casting, and the variation in size of the various parts. In general, a squat casting, whether large or small, requires a large gate.

The position of the gate also depends upon the conditions. Generally, castings are better when gated at the end rather than at the middle, and, wherever possible, gating from the bottom is the ideal method. A gate attached to a heavy mass which joins to a lighter section often results in cavities or pinholes in the heavier mass. A better plan is to attach the gate to the lighter section and cool off the heavy section by means of a chill, unless the difference in bulk is very great. For large differences



LATER STAGE IN THE MOULDING OF THE LIBERTY AERO ENGINE CRANK CASE.

Two crank case castings as removed from the mould. Note the large number of vertical risers, most of which extend to the bottom of the mould. (By Cleveland Osborn Manufacturing Company.)

in bulk the heavier section should be in direct connection with a gate or riser.

Vertical risers of heavy section should always be provided with aluminum.

CHILLS.

Chills should be used wherever there are large bosses or other masses of metal in conjunction with thin sections, unless it is possible to overcome the shrinkage by feeding at that point. The use of the chill must be regarded as a makeshift and only used when it is impossible to use some form of gate.

Chills may be of iron, brass, or aluminum, and should in all cases have annealed iron nails cast into them to assist in holding them in the sand. Stock chills, or chills of standard form that may be used in a variety of jobs are best made of iron.

MELTING.

The melting of aluminum is best carried out in a gas fired furnace, using a mixture of gas and air adjusted so as to give a reducing atmosphere. No special precautions need then be taken to prevent overheating, and "burnt" metal will not result though the temperature be raised considerably above the melting point, or the interval between melting and pouring be long. With this type of furnace the use of a flux is unnecessary. The process is a clean one and requires no stoking or carting of ashes. Heats are simply and easily controlled, and it is found that the labor cost is half that with a coke fired furnace, while the total cost of melting is more than halved.

With the older types of furnaces the danger of overheating must be carefully guarded against. Aluminum has an exceedingly great chemical affinity for oxygen, and at temperatures above the melting point oxidation takes place violently. The oxide formed is heavy and is occluded throughout the molten metal, and if this occurs, satisfactory casting is out of the question. Moreover, like other metals, aluminum in molten condition absorbs gases which may cause blowholes in the casting. When melting in an ordinary coke fired pit furnace, therefore, the temperature must never be allowed to rise much above the melting point, and it is a good plan to protect the surface of the melt by a flux containing zinc chloride or cryolite. This is thrown on to the melt in small crystals and thoroughly stirred in until the thick crust of oxide which forms on the surface is entirely clarified.

When ever possible plumbago or salamander crucibles should be used. Iron crucibles are often used because of their comparative cheapness, but this practice is not to be recommended, particularly with the zinc alloys of aluminum, since these alloys have a tendency to absorb iron.

When remelting borings, turnings, and other small pieces of aluminum scrap, difficulty is experienced on account of the toughness of the oxide film surrounding each particle. This film, which is formed the moment the chip is out, is microscopically thin, but is nevertheless sufficient to prevent metallic contact between the tiny globules which form when the chips are melted. The method usually recommended is to get the crucible half full of molten metal and then stir the chips in, but the difficulty is that the chips prefer to stay on top and refuse to be stirred in.

The best method of melting such particles is to use the same principle as that employed in welding, where fluxes containing chorides and fluorides of the alkaline earths are used to dissolve the oxide. The fluxes used for melting need not be so carefully prepared as those for welding, of course, and a common mixture is 85 per cent. common salt and 15 per cent. powdered fluorspar. The chips are intimately mixed before charging with large amounts of this flux (20 to 50 per cent. of the weight of the chips, depending upon their degree of cleanliness) and the whole is then melted at a fairly high temperature. The flux is very cheap, and the percentage of metal recovered by this process is extremely high.

[This article will be concluded in the May issue.—Ed.]

One plater uses 12 gallons sulphuric acid to 200 gallons of water, for pickling. Temperature 150 to 180 degrees. By agitating, he points out, they consume only two-thirds as much acid as otherwise.

Some Plating and Chemical Problems

A Few Difficulties Encountered in Plating and Chemical Plants and Their Solutions

Written for The Metal Industry by CHARLES H. PROCTOR, Plating-Chemical Editor

Silvering Mirrors

Mercury is no longer used in the production of mirror glass. The process as now practiced is the silvering method. It requires some experience to produce a uniform coating of silver. The glass must be chemically clean. This cleansing may be accomplished in various ways: denatured alcohol and whiting, one part nitric acid and ten parts water or the same proportions of hydrofluoric acid and water, followed by thorough washing in cold water.

The apparatus used in the silvering of glass is a steam table; slabs of marble or cement set in a trough of wood, several thicknesses of canton flannel laid on the marble or cement table so that the silver solution may be absorbed that runs from the glass. Rubber bands of sufficient width placed around the mirrors if small keep the solution from running from the glass.

Solutions for silvering are composed as follows:

Solution A. Distilled water..... 5 ozs.
Pure silver nitrate..... 1 "

Dissolve the silver nitrate in the water, which may be slightly warm. Then add 26 per cent ammonia water drop by drop until the precipitate of oxide of silver formed is dissolved and no more. Care must be used not to add an excess of ammonia. Now add water to make one gallon of solution. Keep the solution in a glass-stoppered bottle away from the light.

Solution B. Water .....10 ozs. warm
Rochelle Salts ..... ½ oz.

When the Rochelle salts are dissolved add ⅛ oz. silver nitrate. The solution so prepared should be boiled for about 10 minutes. When cool, filter through absorbent cotton in a glass funnel to remove the black sediment. When this has been done add sufficient cold water to make one gallon. Keep this solution in a glass-stoppered bottle away from the light.

The proportions used in silvering the glass are equal proportions of A and B. The silvering solution should be mixed as required. It requires from thirty to forty-five minutes to obtain a good coating.

The silver solution is flowed upon the glass previously cleansed, as outlined, and remains until the silvering operation is completed. The solution after use should be saved. Some silver is held in solution, but do not use it again.

It has been noted that when a sensitizing solution is used before applying the silver solution, the silver precipitates more readily. The sensitizing solution consists of:

Solution C. Water .....1 gallon
Stannous chloride (bichloride of tin)..... 1 oz.

Flow the tin solution over the glass, remove, wash off with clean water and then apply the silver solution.

Mechanical methods are frequently applied, so that the glass to be silvered is given a slight rocking motion.

Grained Black Walnut Finish on Steel

To produce a finish similar to the imitation black walnut applied to maple wood, upon steel it will be necessary to follow the wood-finishing method to be seen on National Cash Registers, fireproof furniture, etc.

Briefly, the process is as follows:

1. Articles made from steel should be cleansed and copper-plated in copper cyanide solutions.

2. A priming coat of enamel should be sprayed upon the copper-plated surface. The color should be considerably lighter than the final finish. A dark brown with a greenish tinge should be used. When the priming coat of enamel is thoroughly dry it is ready for the wood-graining coat.

3. The method used to apply the grain is to use a small printer's roller made from rubber. The grain of the wood imitated is raised on the rubber roller, the same as the letters on a rubber stamp. The diameter of the printing roller should be equal to the length of the article to which is applied the wood grain. Heavy black or tinted printer's ink is used. Either a piece of hard wood or flat stone is used for applying the ink to the roller, as very little should be used.

4. After the printing roller has given the wood grain imprint to the priming coat of enamel, and while the ink is still sticky, the color should be blended with a camel's hair or sable varnish brush, especially in imitating black walnut.

5. When the imprint is thoroughly dry, lacquer the entire article by spraying. A brush cannot be used.

It is almost impossible to get a good imitation of the finish by chemical methods. Enameling and printing will be more satisfactory and can be brought to an efficient basis.

Enamels used in the process can be obtained from any good manufacturer. Send a sample along to them for priming and finishing enamels.

Dark Finish on Brass or Bronze

It is difficult to deposit a black finish to give good wearing qualities on brass or bronze. Black nickel is too soft. A celluloid enamel would answer the purpose better than any other material. Such an enamel could be obtained in the color that would be most suitable, either black or any shade of brown.

If the metal parts are first sand-blasted and the enamel sprayed upon the surface a serviceable finish can be obtained. From a color card issued by many paint manufacturers, a suitable color can be selected for any purpose and sent to any good lacquer manufacturer to be matched in the enamel. Below, however, are several formulas for brown finish. To protect the finish the articles would have to be lacquered.

No. 1. Water 1 gal. Temp. 180 deg. Fahr.
Copper Sulphate...1½ lbs.
Nickel Sulphate...4 ozs.

No. 2. Water 1 gal. Temp. 180 deg. Fahr.
Copper Sulphate...3 ozs.
Chloride of Potash.3 ozs.
Acetate of Copper.3 ozs.
Hyposulphite of Soda .....3 ozs.

No. 3. Water 1 gal. Temp. 180 deg. Fahr.
Sulphide of Barium.1 oz.
Caustic Potash....1 oz.

The brass parts should be cleansed as usual, immersed in any of the brown dips for a minute, removed, washed in cold and boiling water, scratch-brushed, dried, and then re-immersed in the dip to deepen the tone, washed, dried out and finally lacquered or waxed.

Recovering Silver from Old Solution

One way to recover the silver from an old silver solution proceeds as follows:

1. Evaporate the solution by passing steam through a lead coil to concentrate the solution as much as possible.

2. Remove portions of the solution so concentrated to an acid jar or stone ware tank, preferably surrounded by hot water to produce a greater activity in precipitation.

3. Add commercial muriatic acid slowly by stirring. Be careful to avoid the liberated cyanogen gas, which is very poisonous. Add the acid in excess so that all the silver is thrown down as a chloride. When this has been accomplished, wash the precipitate a number of times until free from acid. Dissolve in cyanide of sodium and add to the solution again.

If the solution contains any silver whatever, that is, enough to make its precipitation worth while, then it is advisable to evaporate as noted. If the silver does not settle down add common salt to help, but the muriatic acid should give ample precipitation. Of course, a felt filter bag can be used to filter the silver from the wash water.

Cementing Glass and Brass

The United States Government specifications for a cement for uniting brass to glass for naval fixtures, etc., is based upon a combination of glycerine and litharge. The latter material must be the red and commercially pure.

The cement is prepared as follows. Into a suitable quantity of glycerine gradually sprinkle the litharge until it becomes a pasty mass, that will not run. Place the cement on the metal parts. Then adjust the glass. It will set hard at normal temperature.

Do not prepare too much cement at one time. It is more effective when specially prepared.

When it is necessary to remove the cement, place the cemented article in a warm caustic soda solution, about 8 ounces per gallon of water. The cement will gradually soften as the caustic soda absorbs the litharge, which is an oxide of lead.

Metallizing Non-Metal Articles

In metallizing plaster of paris objects the manipulations as here given should be closely followed.

1. After the plaster casts are made, dry slowly at 120 deg. to 140 deg. to eliminate as much moisture as possible.

2. Immerse in boiling paraffine wax, to which is added as a hardener, 1 oz. of Carnuba Wax per pound of paraffine wax. The temperature should equal that of boiling water, 212 degrees.

3. Drain from the paraffine wax, allow to cool and harden. Then spray upon the wax a thin coating of orange shellac varnish cut in denatured alcohol.

4. After the shellac coating is dry then spray on uniformly a coat of platers' copper bronze powder. The copper bronze should be mixed with a transparent collodion lacquer, thinned so that it flows freely when mixed with the bronze powder. See that every part is thoroughly covered. The lacquer firms sell this lacquer under the term "copper bronze powder lacquer" or "medium."

5. When the bronze powder is thoroughly dry immerse the articles in a silver or whitening dip. This dip is prepared from

Water	1 gal.
Silver Cyanide	¼ oz.
Sodium Cyanide	2 ozs.

The immersion for a second will produce a whitish tone. The object of using the silver dip is that the rate of deposition of copper from the sulphate solution can be more readily observed than when the surface is left plain copper bronze.

6. Plate in a copper sulphate solution which should contain about 2½ lbs. copper sulphate per gallon of water with or without the addition of small proportions of sulphuric acid. Solution should be agitated with air 2 to 3 lbs. pressure.

It is advisable to plate not less than five hours.

Any finish may be applied to the metallized objects, when copper plated.

Dip Tinning Steel Stampings

The manipulations in connection with dip thinning of steel stampings are as follows:

1. Removing grease or oils in a cleaning solution heated to 200 deg. Fahr. composed as follows:

Water	1 gal.
Caustic Soda 70 per cent	4 ozs.
Soda Ash 58 per cent	4 ozs.
Silicate Soda	1 oz.
Yellow Rosin	¼ oz.

2. After cleansing wash in cold water. Pickle to remove scale in a hot solution of hydrofluoric acid and water.

Water	1 gal.
Hydrofluoric Acid	1 lb.

3. After the scale has been removed wash again in cold water and immerse in the zinc chloride flux. The zinc chloride flux is prepared by dissolving all the scrap sheet zinc commercial muriatic acid will dissolve. The zinc must be added slowly to prevent too great a generation of heat and hydrogen gas.

When the acid has dissolved all the zinc it will consume it is ready for use. Dissolve in every gallon ½ pound gray sal ammoniac. Pass the work through the flux and drain.

4. The steel is now ready for tinning. Small stampings should be immersed in the tin on soft steel wire or in iron wire baskets specially made for the purpose. The tin should be heated in an iron kettle to 500 deg. Fahr. Pure straits tin is advisable. Occasionally a little gray sal ammoniac should be sprinkled upon the top of the molten tin to prevent excessive drossing.

5. After the steel articles are coated, shake well to remove the excess of tin and cool in parafine oil or hot water to which is added about 1 oz. carbonate of ammonia per gallon of water.

6. Dry in sawdust or, if paraffine oil is used, in flour of the cheapest kind procurable. On plain surfaces the flour does not scratch.

Frequently the articles are retinned or a second coat applied. In such event the articles go directly from one tinning kettle to the other. The second dip is maintained at a slightly lower temperature and the surface of the molten tin covered to a depth of two inches with Beef Tallow, Palm or Cocoanut Oil. The tallow or oils act as a flux and gives a smoother and brighter tinned surface.

Should rust develop on the steel stampings after pickling a warm solution of

Water	1 gal.
Muriatic Acid	1/3 gal.

should be used to remove it before putting the articles in the zinc flux, as tin will not adhere to a rusty surface.

Plating Brass Hooks and Eyes

One firm was plating brass hooks and eyes by the method of hanging sheet or bar of tin in a solution of cream of tartar and water, and placing the hooks and eyes into the bath, but a few days after the work was supposedly finished, the plating turned yellowish. Their intention was therefore to silverplate the hooks and eyes instead of tinning.

From the above information it was clear that the amount of tin deposited upon the hooks and eyes was infinitesimal, otherwise they would not have turned yellow.

In tin plating by the boiling Cream of Tartar solution method a saturated solution of Cream of Tartar must be used; maximum two pounds per gallon. The articles to be tinned should be placed between thick sheets of perforated Straits Tin, say about two inches in depth of materials. The boiling should be continued for at least five hours at a low boil when ample tin should have been deposited. The articles so tinned should be carefuly washed in clean cold water and then tumbled for a short time in hot Maple Sawdust.

It is well to use about 1 oz. Black Platers' Compound per gallon of boiling water. The compound will assist in drying out the articles as the water will run away from them more readily.

This is the method used by manufacturers of Snap Fasteners, although some firms use a bright nickel deposit upon their product.

Presuming that the hooks and eyes are made from brass they can be silvered by simple immersion. However, before silvering it is necessary that the hooks and eyes be clean and bright, preferably acid dipped using the regular bright acid dip made up of sulphuric acid and nitric acid. The silvering is best accomplished in two solutions.

1. Cold water .....1 gal.
   Silver Trisalyt .....1 oz.

Time of immersion one to two or three seconds.

2. Drain well and immerse direct in a hot solution 180 deg. Fahr. consisting of

   Boiling Water .....1 gal.
   Silver Trisalyt .....½ oz.

The same method of washing and final drying should be followed as mentioned for tinning.

Metal Plating

Part 4. A Compilation of Tables Showing the Time Required to Deposit a Given Thickness of Copper from Acid Sulphate Solution.*

Written for the Metal Industry by W. G. KNOX, Associated with the Chemical Laboratory of the Western Electric Company, Inc.

As indicated in the article accompanying Table 3, in THE METAL INDUSTRY for January, 1920, this installment covers the deposition of copper from the acid sulphate solution or the bivalent form. Simply stated this means theoretically that exactly one-half the amount of metal is deposited from the acid solution as from the cyanide solution. The maximum amount of metal which it is possible to deposit or throw out of solution by the passage of one ampere per second is by calculation .0003294 gram. Therefore, figuring on the above basis, one ampere for ten minutes should deposit .1976 gram of copper; one ampere for thirty minutes should deposit .593 gram of copper, or the same amount where two amperes at fifteen minutes is employed.

There is one feature in connection with the use of the acid sulphate copper solution which makes its use advantageous where it is practicable, and that is in the high cathode efficiency obtainable. It was pointed out in Article 3 that at times the cathode efficiency in copper cyanide solutions may not exceed 40 or 50 per cent. Such low figures are quite improbable with the acid sulphate solution. With properly maintained solutions of the latter type it is not difficult to obtain 90 per cent or more. In fact the efficiency of the copper sulphate bath is so high that such solutions may be placed in series with other types of plating baths to measure the current passing, the weight of copper deposited in unit time being a measure of the average current. The copper solutions used for this purpose are essentially mixtures of copper sulphate with sulphuric acid and water. For more accurate control the silver voltameter is used. It is but natural to infer therefore that if a solution can be used actually to measure the average current in a circuit, it should give a high cathode efficiency value. With most plants this is the case. Refining plants with their very large electro-plating departments, deposit copper from the acid sulphate electrolyte. The yield is high and the deposits good.

There are certain precautions which the average electroplating shop should observe when using acid copper solutions and these are:

1. Never try to plate directly on iron or steel because of the electro-positive nature of the metal and its ability to displace copper from this type of plating bath.
2. Stir or agitate the solution frequently if no automatic device for this purpose is provided. Failure to keep the solution well mixed will frequently cause a very unsatisfactory deposit. This of course may be said to be true of other solutions as well.

The table shown in this issue has been calculated on the basis of one hundred per cent (100 per cent) cathode efficiency. For the purpose of meeting the average shop requirements it will be necessary to add ten (10) per cent to each figure of time shown in the table to obtain a deposit of the required weight and thickness. This corrective figure may not at all times suffice should close control of deposit be necessary for the reason that very few solutions are maintained with the maximum degree of care, but for practical purposes it will be as nearly correct as can be calculated, unless special tests are carried out with a view to determining the exact conditions of a plating solution. The latter procedure is recommended where close control is required.

The next table to be published will be on lead and the writer will at the same time submit an article covering the value of this metal as an agent against corrosive influences as compared with some of the other metals used for similar purposes.

*For Parts 1, 2 and 3 see THE METAL INDUSTRY for June, 1919, August, 1919, and January, 1920, respectively.

TIME REQUIRED FOR A THICKNESS IN INCHES OF COPPER (DIVALENT)
Calculated on a basis of 100% cathode efficiency.
Hours, Minutes, and Seconds.

Current Density.

Amperes per Sq Foot	Amperes per Sq Inch	.00001	.00002	.00003	.00004	.00005	.00006	.00007	.00008	.00009	.0001	.0002	.0003	.0004	.0005	.0006	.0007	.0008	.0009	.001	.002
1	.007	:10 24	:21	:32	:42	:53	1:04	1:14	1:25	1.35	1.46	3:32	5:17	7:03	8.38	10:34	12.20	14.05	15.42	17:47	35:34
2	.014	:05 12	:10 24	:16	:21	:27	:32	:37	:42	:48	:53	1:45	2.39	3:31	4:14	5:17	6:10	7:03	7.53	8:49	17:38
3	.021	:03 36	:07 02	:10 24	:14	:17	.21	:25	.28	:32	:35	1:10	1:45	2:21	2:56	2:21	4:06	4:41	5.17	5:52	1:44
4	.028	.02 48	:05 48	:08	:10 24	:13	:16	.19	:21	.24	:27	.54	1:21	1:46	2:12	2:39	3:06	3.32	3:59	4:25	8:50
5	.035	:02 24	:04 48	.06 12	:08 36	:10 24	:13	:15	:17	19	.21	:43	1:04	1:25	1:46	2:07	2:28	2:49	3.11	3.32	7:04
6	.042	:01 48	:03 36	:05 24	:07 12	:09 00	.10 24	:13	:14	.16	.18	:36	.53	1:11	1:28	1:46	2:04	2:21	2 34	2:57	5:54
7	.049	:01 30	:03	.04 30	.06	.07 30	.09	:10 24	:12	.14	:15	:30	:45	1.00	1:15	1:30	1:45	2:00	2.15	2:30	5.00
8	.056	:01 12	:02 36	:03 48	:05 00	.06 36	.07 48	.09 12	:10 24	:12	:13	:27	:40	:53	1.06	1:19	1:32	1:45	1:59	2:12	4:24
9	.063	:01 12	:02 24	:03 36	:04 48	:06 00	.07 12	.08 24	.09 36	.10 48	:12	:24	:36	:47	:59	1:11	1:23	1:35	1:47	1:58	3:56
10	.070	:01 12	:02 24	:03 36	:04 48	05 00	.06 12	.07 24	.08 36	.09 48	10 00	:22	:32	:42	:53	1:04	1:14	1:25	1:35	1:46	3.32
15	.105	.00 48	:01 24	.02 00	.02 48	.03 36	.04 12	.04 48	.05 24	.06 00	.07	.14	.21	.28	.35	.42	.49	.56	1.03	1.10	2.20
20	.140	.00 36	.01 12	.01 36	.02 00	.02 48	.03 24	.04 00	.04 48	.05 24	.06 00	.12	.18	.24	.30	.36	.42	.48	.54	1.08	2.16
25	.175	.00 30	.00 54	.01 18	.01 42	.02 06	.02 30	.02 54	.03 18	.03 42	.04 06	.10	.15	.20	.25	.30	.35	.40	.45	1.00	2.00
30	.210	.00 24	.00 48	.01 12	.01 36	.02 00	.02 24	.02 48	.03 12	.03 36	.04 00	.08	.12	.16	.20	.24	.28	.32	.36	1.12	2.24
35	.245	.00 21	.00 42	.01 03	.01 24	.01 45	.02 06	.02 27	.02 48	.03 09	.03 30	.07	.10 30	.14	.18	.21	.25	.28	.32	.35	1.10
40	.280	.00 18	.00 36	.00 54	.01 12	.01 30	.01 48	.02 06	.02 24	.02 42	.03	.06	.09	.12	.15	.18	.21	.24	.27	.30	1.00
45	.315	.00 16	.00 32	.00 48	.01 04	.01 20	.01 36	.01 52	.02 08	.02 24	.02 40	.05 20	.08	.10 40	.14	.16	.19	.21	.24	.27	.54
50	.350	.00 14	.00 28	.00 42	.00 56	.01 10	.01 24	.01 38	.01 52	.02 06	.02 20	.04 40	.07	.09 20	.12	.14	.17	.19	.21	.23	.46
55	.385	.00 13	.00 26	.00 39	.00 52	.01 05	.01 18	.01 31	.01 44	.01 57	.02 10	.04 20	.06 30	.08 40	.10 50	.13	.15	.18	.20	.22	.44
60	.420	.00 12	.00 24	.00 36	.00 48	.01 00	.01 12	.01 24	.01 36	.01 48	.02 00	.04 00	.06 00	.08 00	.10 00	.12	.14	.16	.18	.20	.40
Grams per Square Inch		.00146	.0029	.0044	.0059	.0073	.0088	.0102	.0117	.0132	.0146	.0292	.0438	.0584	.0730	.0876	.1022	.1168	.1314	.1460	.292

Atomic Weight of Copper ---------- 63.5
Specific Gravity of Copper ---------- 8.9
Electro-Chemical Equivalent of Copper (Divalent) -- .000329

Note — Time below 11 minutes given in minutes and seconds, 11 minutes and above, in hours and minutes

TABLE SHOWING THE RATE OF DEPOSITING OF COPPER FROM ACID SOLUTION.

Bronze Plating

A Paper Presented at the Thirty-seventh General Meeting of the American Electrochemical Society, Held in Boston, April 8-10, 1920.

By F. C. MATHERS, Assoc. Professor of Chemistry, Indiana University, and STANLEY SOWDER, Indiana University

ABSTRACT.

Bronze, a copper-tin alloy, can be plated or electro-deposited from the oxalates of copper and tin dissolved in ammonium oxalate or from a mixture of potassium copper cyanide, potassium stannate, potassium cyanide, and potassium hydroxide. The bath containing cyanide is better. A careful adjustment of the relative quantities of copper and tin in the baths is necessary. Most trouble is caused by the poor corrosion of the bronze anodes.

REVIEW OF THE SUBJECT.

Bennett[1] has given the formulas of the bronze baths that have been described in the literature. He states that practically all of them are impracticable. Commercially the bronze color is imitated with brass or by coloring with a reagent.

Treadwell and Beckh[2] have tried out several different baths. They obtained bronze deposits from the oxalates of copper and tin dissolved in potassium oxalate, and from a mixture of potassium copper cyanide and sodium sulpho-stannate (Na_2SnS_4).

They were unsuccessful with the potassium-copper cyanide and sodium stannate bath,[3] obtaining principally a copper deposit. In most of their work, electrolysis of a bath was only continued for a short time, and platinum anodes were used. In commercial work the bath must operate for long periods of time with only easily made adjustments. Moreover, bronze anodes should be used and they must dissolve with near to theoretical efficiency, otherwise the composition of the bath cannot be maintained.

Kremman, Suchy, Lorber and Maas[4] also obtained satisfactory deposits from a bath of sodium tartrate, stannic chloride, copper sulphate, and sodium hydroxide. However, this bath soon became useless due to the decomposition of tartrate at the insoluble or passive copper anodes.

MANIPULATION.

Two anodes (90 per cent. copper and 10 per cent. tin), and 4 by 4 cm. (1.6 by 1.6 in.) were used in each bath of 200 c.c. (½ pint). The single cathode in each bath was 4 by 4 cm. The temperature was 40° to 50° C. At low temperatures the anode corrosion was less good. The current density was 0.4 amp. per sq. dm. (3.75 amp. per sq. ft.). A decrease in current density increased the proportion of the more easily deposited constituent; copper in the oxalate bath and tin in the cyanide stannate bath.

EXPERIMENTS.

Oxalate Baths. The bath recommended by Curry,[5] 5.5 per cent. ammonium oxalate, 1.5 copper sulphate, 0.42 stannous oxalate and 0.5 oxalic acid, gave a bronze deposit for a short time, but continued electrolysis gave only hard brittle copper, due to the poor corrosion of the anodes. The 5.5 per cent. ammonium oxalate will dissolve much more copper and tin than the quantities used, hence experiments were made with more concentrated baths. The copper sulphate was made as high as 3.5 per cent., the stannous oxalate 2.5 per cent., the oxalic acid was varied from 0 to 2 per cent., and the ammonium oxalate was made as high as 6.5 per cent. Satisfactory baths were not obtained in any case. Sufficient tin did not dissolve from the bronze anodes, but a slime rich in tin formed upon the anodes. This was an unexpected source of trouble since tin anodes had been found to dissolve with practically theoretical efficiency in an ammonium stannous oxalate bath.[6]

Various additions, such as tartaric acid, boric acid, citric acid, sulphites, potassium chloride, magnesium sulphate, ammonium chloride, ammonium citrate, hydrogen peroxide, alcohol, peptone, glue, gum arabic, and potassium sulphate, produced no improvement with bronze anodes. Ammonium citrate and potassium sulphate used with the ammonium oxalate gave good corrosion efficiencies with pure copper anodes but not with bronze anodes. The only method found of maintaining the composition of the bath was as follows: A 500 c.c bath containing ammonium oxalate 6 per cent., copper oxalate 2 per cent., ammonium citrate 1.6 per cent., potassium sulphate 1.2 per cent., and citric acid 0.4 per cent., was electrolyzed with copper anodes. A 50 c.c. portion of the bath was removed and treated with strips of pure tin, whereby copper was precipitated and tin went into solution. Every few hours, a fresh 50 c.c. portion of the bath was removed for treatment with the tin and the previous portion was filtered and returned to the bath. In this way the ratio of copper and tin in the bath was kept sufficiently constant to give nice bronze cathode deposits. One of these small baths was kept in almost continuous operation for two months and good bronzes were obtained during the entire time.

Cyanide Baths. Very good deposits were obtained from a bath containing potassium hydroxide 5 per cent., potassium cyanide 0.5 per cent., stannic ammonium chloride 0.38 per cent, and potassium copper cyanide 1.5 per cent. The bronze anodes remained clean and bright and were never coated with slime. For several days only copper was deposited from a new bath. The reason for this non-deposition of tin during this period may have been that reduction to the stannous state was necessary. This preliminary induction period is perhaps the reason that some experimenters have reported failures with baths of this general composition. Any increase in free cyanide decreased the rate of copper deposition, hence gave a tin-colored deposit. The use of too much free cyanide is one of the difficulties with many of the baths described in the literature. No difficulty was encountered in the operation of this bath.

In another bath, using a mixture of stannic sulphide dissolved in sodium sulphide and potassium copper cyanide, the anodes did not corrode well and principally copper was deposited. Treadwell and Beckh had found that bronze anodes did not corrode properly in baths of a similar composition but they were able to obtain a bronze deposit upon the cathode. Their experiments were run only for short intervals of time.

[1] Trans. Amer. Electrochem. Soc. (1913), 23, 255.
[2] Zeit. Elektrochem. (1915), 21, 374.
[3] Kremman D. R. P. 167718. Monatsh., 35; through Chem. Abstr. (1914), 8, 2118.
[4] Kremman D. R. P. 167718. Monatsh., 35; through Chem. Abstr. (1914), 8, 2118.
[5] Jour. Phys. Chem. (1906), 10, 515.
[6] Mathers and Cockrun, Trans. Amer. Electrochem. Soc. (1916) 29, 411.

All of these experiments were carried out several years ago, hence the use of potassium compounds. Without question the corresponding sodium compounds would work just as well.

SUMMARY.

Bronze can be deposited from a bath containing potassium hydroxide 5 per cent., potassium cyanide 0.5 per cent., ammonium stannic chloride 0.38 per cent. and potassium copper cyanide 1.5 per cent. Satisfactory corrosion of bronze anodes is obtained, using a temperature of 40° to 50° C., and current density of 0.4 amp. per sq. dm. (3.75 amp. per sq. ft.).

Bronze can also be deposited from a bath containing copper oxalate and tin oxalate dissolved in ammonium oxalate, together with some potassium sulphate, citric acid, and ammonium citrate or similar salts. Bronze anodes will not corrode properly, hence copper anodes must be used. The tin content of the bath can be maintained by regularly precipitating the copper from a portion of it by using metallic tin.

The Production Department

An Outline for the Work of a Production Engineer

Written for The Metal Industry by M. H. POTTER

Analyzing the functions of a production engineer and his relation to the organization is of value not only to the larger concerns in a position to use a high salaried efficient production man but helpful to any progressive concern as a means of increasing output and reducing the manufacturing costs.

By means of charts as a method of analyzing a careful study can be made by the governing executive and steps taken to secure the desired results. Although different undertakings vary as to important points and functions which go to make up an efficient organization, the principles underlying proper production supervision are identical.

In other words, it is obvious that the methods and standards of any foundry will vary from those of a plating or galvanizing establishment but by means of a definite method of analyzing and systematic means of studying existing conditions no difficulty will be encounted by the executive.

Much has been written from time to time relative to efficient production methods and systems but few rules and methods which can be directly applied to an individual organization are given. The actual results, therefore, have as a general rule no cash value as they are not practical or applicable in any great measure.

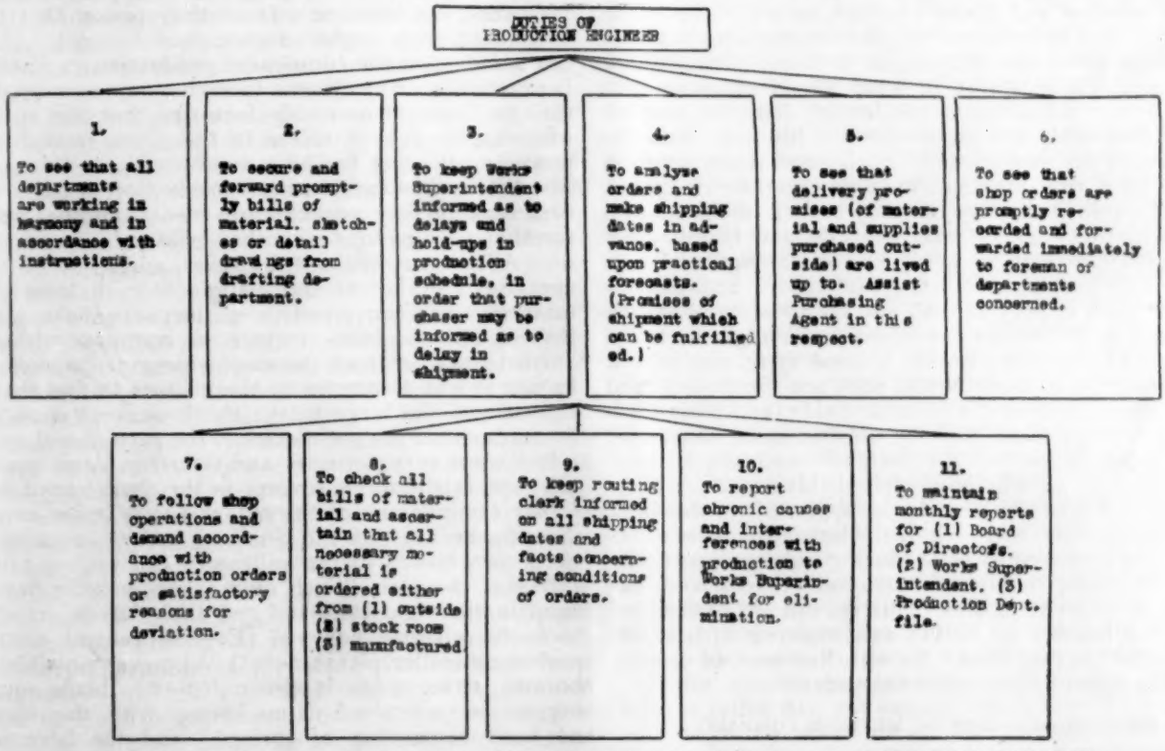


CHART SHOWING THE RESPONSIBILITIES AND WORK IN DETAIL OF A PRODUCTION ENGINEER.

The production engineer has under him the following subordinates:

Shop Engineer.
Inspector.
Move Material Clerk.
Stores Clerk.
Routing Clerk.
Schedule Clerk.
Cost Clerk.
Shipping Clerk.
Receiving Clerk.
Time Clerk.
Messengers for mail, delivery, errands, etc.

He is responsible directly to the Works Superintendent. The chart shows how his duties are divided.

German Cutlery Manufacturing Practice

An Abstract of a Lecture Before the Sheffield Cutlery Trades Association

The British Government recently granted permission and gave safe conduct to a trade deputation of Sheffield manufacturers to view the methods of manufacture of German cutlery, and some impressions of the visit were given by Mr. Frank B. Colver (a member of the deputation) in an address delivered before the Sheffield Cutlery Trades Association.

Solingen, said the lecturer, is a very pleasant place, one of a number of smart little towns manufacturing cutlery, scattered over a hilly and well-wooded country, reminding one of Derbyshire. Larger than Bakewell, reminding one of that doyen of market towns in setting and cleanliness—it possesses some good public buildings and theatres. In this, as in many other material particulars, it is the very antithesis of smoky lack-method Sheffield. Its factories are, as a rule, widely separated, and in almost country surroundings. Large, well-lighted shops, heated by steam, with window and floors as clean as a private house, method and orderliness are the outstanding features of large firms like Kaufmann & Sons. The smaller factories are scattered in what would compare with our better middle-class residential districts, and almost invariably the proprietor has his factory at the bottom of his own garden. Such small manufacturers were as a rule practical men with a knowledge of, and the ability to carry out, any branch of their trade. Most of the workers wear overalls, and facilities are provided for them to wash before leaving for home. This was not the first visit Mr. Colver had paid to the German cutlery capital, and on no occasion did he ever see in the streets a workman who might be called dirty. The workers are of a good type, and take a keen interest in their work; they are methodical and their work benches are clean and tidy, and their tools never of a make-shift or old-fashioned character. These characteristics, the lecturer maintained, were confirmed by all who have visited this area.

The Solingen cutlery trade appeared to be in a flourishing state, and such of the hundreds of factories inspected appeared to be producing in large quantities. He was unable to say how many employees were engaged at present in this industry, but in 1908 Lloyd gave the number as 12,000, as compared with 15,000 in Sheffield at that time. He was, however, of opinion that the figures stood reversed today.

ENGLISH AND GERMAN METHODS COMPARED.

Regarding methods, Mr. Colver stated that there are not many methods in vogue in Solingen that are not well known on this side and in daily use in some English industry or other. The cutting up of celluloid was new to him, but he now learns that a similar method for cutting up leather in England is employed. No question of initial cost seems to weigh with the German if he can see bulk production ahead. Whilst some aim at quantity before quality, others, by carefully chosen methods and super-skilled men for operations calling for skill, turn out cutlery of a very high grade. As a manufacturer himself he recognized this to the full, and stated that one should not judge the German quality on the material sent for the English market, as this by no means represented their best production.

There was a greater variety of methods in different factories for producing the same article than obtains in England, but the reference to methods of manufacture that follow may be taken to be in fairly general use. Some of these methods are adopted by Sheffield firms, and generally one may say they are cognizant of them all.

The Germans, as a rule, appear always to aim at "big business," and lay themselves out to produce economically any pattern which promises to sell in large quantities. They have no use for oddments and the wasteful attention to orders for "quarter dozens of No. 413," the curse of many a Sheffield manufacturer, would not be entertained for a moment by a German house. For example, in several factories the mission actually saw machines flying out brass penknife scales at the rate of 3,500 per hour, and these not material factories, but actually for their own individual consumption.

Speaking of the "material" or component manufacturers, the lecturer was of the opinion that they specialized to a higher degree than his did. (Is it not a fact that the component production in Sheffield is practically nil?) It was to such component production and central assembly factories that the success of Solingen over Sheffield in the years immediately preceding the war has been attributed. On this point, Mr. Colver confirms the mass production of parts, one firm making only pocket knife blades, another scales for that type of knife, another scissor blades, and so on. All the larger firms, however, appear to be self-contained, so far as the manufacture of their own materials was concerned (e. g., Henkels, Bokers, and Robert Klaas). One feature in common with old Sheffield practice was the employment of outworkers: in fact it was a surprise to the visitors to find that in the case of the large works the inworkers were less in number than the outworkers. The parts issued to the latter were very accurate and issued in large quantities, and this practice (except in the character of such issue) reminds one of the old, and to a lesser extent, the present days of the Sheffield cutlers, working in their own homes in the valleys of the various tributaries of the Don. Such outworkers usually have a shop in their gardens, and run their lathes or other tools by electric power. (English central electric power controller please note!) Wherever possible laborious, tiring work is eliminated—no "blade squaring, as he understood it, no boring with the breast, no hand hammering of springs," and the labor and discomfort of grinding is reduced to a minimum by the blades being forged thin, smooth and free from scale. Polishing, for producing a fine finish, is accomplished with less muscular effort than in Sheffield.

The method of grinding and dust extraction were specially referred to and illustrated by slides. The polishing and grinding machines, contrary to the Sheffield practice, ran towards the worker. It was so arranged that in the majority of operations the German sat down to his work. The dust extraction methods were very efficient, and probably the compulsory use of such preceded British enforced adoption of it.

Passing to a detailed study of operations, Mr. Colver stated that in the manufacture of pocket knives the blades were made from sheet steel, and in pre-war days much of this steel was supplied from Sheffield. "Moods" are first flied out under a hammer, the type of which may be out of date, although they

were told that many hundreds are in use in Solingen. By such means a German manufacturer pointed out that a man could forge 300 pocket blades or 450 penknife blades per hour, that the man could sit down to his work, and in his opinion the value of the hammer lay in the elasticity of the blow. The blades so produced, the lecturer said, thin on the edge, had a perfect taper, and were always smooth and free from scale. This freedom from roughness in intermediate stages obviously has its reflection in the labor required in the finishing operations. Heating is carried out in coke fires, supplemented by a proportion of charcoal; forging is done at a low heat. After the subsequent operation of "plating" (smoothing?) the blade is annealed, and the depression for opening with the nail is carried out in the cold, as is the flying out to shape. A primitive, but effectual, hammer is used for straightening, the same hammer being used for straightening springs. Very little boring is done, punching holes in blades and springs being the common practice.

In the process of hardening the Germans use special care. With the exception that a number of blades are hardened at once by means of special tongs, the practice is similar to that at Sheffield, a coke fire being employed.

The tempering is carried out in a revolving iron box, having a capacity of several gross, and the attainment of the correct "temper color" is judged by opening the box from time to time. The average time for such operation is twenty minutes. "The blades we saw were perfectly tempered, and thousands of grosses were being dealt with in this way. The great piles of blades made us realize almost more than anything else the magnitude of the German cutlery trade."

With regard to grinding, no machines for grinding pocket knife blades were seen, but it was learned that such a machine was about to be placed on the market.

Generally most of the grinding is done by hand, a reddish-looking sand stone being used, which appeared to cut very well. A larger grindstone was used than in the Sheffield practice, and, as previously pointed out, ran towards the man. With his knees protected by pads, he was, by means of a flat stick, able apparently to exert a greater pressure during the process of grinding (probably due to the direction of the stone noted and using his legs instead of his arms to get the necessary pressure). In any case, the previous excellent preparation of the blade—its freedom from roughness—enabled a greater output to be attained than in English practice. Nor are the processes of polishing so many as in our shops, and the fact that the edge of the blade is in sight the whole time probably speeds up the process. Glazing and polishing are carried on in shops other than that allocated to grinding, the machine employed being of the low floor type common to the Birmingham polishing trade.

In the matter of final polishing the Germans are highly skilled, and do it in a very short time. The soft-leather-covered wheels run very quickly, and some wet polishing paste called "Polierroth"—a mixture of a red powder with methylated spirits and water—is applied to the wheel. This, it was learned, was made by special treatment of English crocus powder. Much polishing is done by means of dollys and buffs, with which a white paste of Vienna lime, spirit and water is used, applied by means of a stick. After polishing the blades are varnished before being sent to the cutler, so as to prevent scratching or rusting during the latter operation.

The bolsters are as a rule soldered to the scales. "The Germans are very fine tool makers, and their very accurately turned out components make the cutlers' work quite light and pleasant.

Referring to razors, the lecturer said that these were forged under drop hammers, not by hand, but the finishing was precisely similar to the Sheffield method. Again, he found hardening and tempering operations being done in bulk, fused salt baths being common for the former process. He was impressed with the magnitude of the production of this class of material, noting at one factory no less than 50 grinding machines in full work, and this by no means a solitary instance. Few safety razors were seen, the manufacture of these apparently centering in Berlin. Of those being made, an interesting observation was made by the lecturer, to the effect that the "whetting" of the machine-ground Gillette type razor blade was effected by means of what appeared to be a "burnishing of the extreme edge on a polished steel disc."

Scissors next claimed Mr. Colver's attention. He is of the opinion that, more than anything else, the German shows his superiority over the Englishman in the manufacture of this useful domestic tool. The enormous trade done in this branch may be gauged by the sight of scissor "blanks" being carted about on drays, significantly, too, of one pattern and size. Scissors are all drop forged, and that at one heating by using twin stamps; they have a pair of old dies in one stamp for shaping, and a pair of new dies in the other for finishing. "The 'fash' on German scissor blanks is exceedingly thin, so thin that sometimes you can break it off with the fingers, and the finished blank is," said the lecturer, "very nearly perfect. They certainly understand tool making in Germany. After trimming off the fash, the scissor blades are straightened in a friction press between dies. As far as I can see," said Mr. Colver, "the main reasons the German scissors are so cheap are that they are produced in large quantities and so accurately made that they can be completely ground and finished before putting them together, requiring then only whetting after the two blades are put together." The lecturer here mentioned that he had several valuable details with reference to the "putting together" which he would be glad to convey to any individual member after the meeting. With regard to the special tiny scissors included in pocket knives, these were practically all made by Krusius Bros., who seem to have a world's monopoly.

In the manufacture of table knife blades, the steel used is rolled flat, not square, and is first cut to a special shape, by which means the greatest economy of blank production is obtained from the minimum area of steel. The "bolster" was forged between two pairs of dies in succession, and under another trip hammer the blade was plated without the intermediate Sheffield process of "mooding." The lecturer said that Sheffield manufacturers were very incredulous on this point—but he could only repeat he had seen it done. Except in the production of very long "tangs" (i. e., the portion which goes inside or through the handle) the process was not very different from the British. With the very long tangs spoken of, a very complicated machine called a "four blow hammer" was used. A German table blade when it leaves the forger has a remarkably smooth finish, a thin edge and a straight bolster. Many table blades are ground by machinery, though the bulk was done by hand, as in this country.

Speaking of the educational facilities available, Mr. Colver noted that Solingen possessed a neat little tech-

nical school devoted to the training of boys and girls for the local industries. Boys were being instructed in machine drawing, and there was a large workshop well-equipped with tools and machines for making beds and punches. In another department twin stamps were installed for teaching drop forging. For etching, oxidizing, and the making of those ornamental pocket knife scales, in which the Germans specialize, special and ample equipment for the teaching of the subject was provided.

The discussion, as might be expected, was valuable and interesting. The Chairman, Mr. Charles, in moving a vote of thanks to Mr. Colver, said that the cutlery association was making efforts to get a similar school established in Sheffield, as boys "do not understand the tools sufficiently." Solingen was very clean, each shop had electric power, and everything worked quietly and smoothly. The seconder gave it as his opinion that the Germans captured and have retained the scissors trade since 1879, and did a huge trade with the States. Other contributors to the discussion said that they saw no difficulty in obtaining output (e. g., 3,500 scales per hour) if only they could shake off the folly of letting one man do the whole job instead of placing stamping, flying and similar operations in the hands of a competent engineer. It was hoped that as the result of the recent visit of the Home Office representative the conditions of grinding shops would be improved. He did not agree with the use of trip hammers, in view of the space taken up. To secure the correct angle of the die requires a skilled operator. Shortly, said the speaker, they should beat the German at blade forging. He pointed out that heat treatment was very important, as during the several steps in the mechanical work imposed on the steel, its temperature fell rapidly. The next speaker agreed, but felt that tool makers and grinders were inadequately paid. Mr. Mark Law asked whether it was not possible to bring into Sheffield such of the German methods as the commission had noted, especially the quicker and more efficient mechanical polishing. Mr. Crofts expressed the opinion that there was no fundamental difference between German and English methods. Even if such machines were imported they would be taxed on entering England, so probably we should be worse off monetarily. Why not, said he, let polishers experiment themselves, and above all (for communal and national interest) not keep such methods secret. Why not ask the University to help, interposed the seconder. There was, it must be admitted, a prejudice against the adoption of German methods. The speaker who followed noted that there was a distinct saving in the German method of producing the bolster and tang at one heat, whereas two are the common practice here. The elasticity of the blow secured by the German pattern hammer seemed to him to be better. Mr. Bolton (secretary) said that it was imperative that more attention should be devoted to the tools used, and to this Mr. Charles made reference to the splendid work of the University Engineering Department, and the help it had already given to the trade, and he suggested that the University might help in the preparation of standard samples like those (of Germany) he saw before him. As a society they had no power to get further, as the manufacturer applies the closure to the forward effort when he says "it's good enough." He understood that the Scientific Instrument Society in London were investigating the nature of polishing and polishing materials, and perhaps some valuable help might be obtained in this direction. The German scissors were nearly always nickel plated, said another contributor, and he was very curious to know how they were prepared for plating, as he had noticed where the nickel had stripped off that the layer exposed was black.

Mr. Fisher, the Chairman, said that Dr. Hatfield had at their previous meeting promised any information that would help the practical man in regard to the working of stainless steel, and his recent visits to the works of Hans Renols and Alfred Herbert & Co. convinced him that nothing but tackling the matter through organized and systematic research would solve the difficulties and place the cutlery trade on a sound basis. He pleaded for a larger outlook by manufacturers themselves, a burying once and for all of the stultifying prejudice and jealousy that in no small measure has kept the trade poor and hindered its development.

Mr. Colver, in reply, said that he agreed there was no fundamental difference—but unlike the Germans, "we lag behind because we don't pool our knowledge." The preparation of the blades prior to plating was done by rough glazing, followed by two fine glazing operations, being little different to our methods. He thought that Messrs. Canning, of Birmingham, might help in the polishing problem.

Japanning With Air Pressure in Tumbling Barrels

A Practical Description of a Method of Decreasing the Time of Japanning Small Articles

Written for The Metal Industry by WILLIAM KING, Expert Japanner

The old method of japanning has always been very slow. In tumbling large quantities of small articles such as buttons, snap fasteners, and so forth, it was necessary to wait until evaporation began. It always took from 30 to 40 minutes for 75 to 100 pounds, and would take at least an hour to set before the buttons would be ready to put in the japanning oven. To decrease the time I have found it a great help to roll brass articles in the barrel with potash and have a steam pipe coming into the barrel. To seventy-five pounds of metal rolled take one and a half lbs. of potash. Let it roll about 3 or 4 minutes and let the boiling water or steam come into the barrel during the rolling. Discoloration will set in, and the objects will become very dark. Care should be taken as to the quantity of boiling water or steam. Just enough should be used so that the water covers the articles rolled. After about fifteen minutes of this operation, lower the barrel into baskets and rinse in clean water a few times, when they will be ready for dryer. This will save one coat of the tumbling japan.

The new method, that is the use of air pressure, is to have a small size blower installed on a ceiling with four or five inch piping, on the intake from a window and the other, or supply line running along the ceiling down to the barrel, with a slide in the pipe so that it can be shut off without interfering with the fan. When the work is in the the barrel ready for tumbling pour the solution in; let this roll for a few minutes, and when all the work is covered pull out the slide and let the air hit about the center of the barrel. This will cause evaporation to begin immediately. Care should be taken not to take the particles out too soon, as they will soften up

again afterwards. The piping from the pan to the barrel is a very important point. Too much oil will cause the oil to be carried to the barrel which is dangerous; so the air should be filtered. This method has increased production over the old way 75 per cent with good results in every detail. Brass buttons and snap fasteners should be baked at about 330° C. for three hours. Care should also be taken between coats; the undercoat must be thoroughly baked before tumbling the next or softness will appear; that is if the metal shows on the second coat it is because it is not baked enough. The best results can be obtained with a good black rubber coating with covering quality. The first coat is reduced 100 per cent; this will cover with a good body in coating the bright finishing japan on the next coat which should be reduced about 50 per cent.

I have also found after considerable work on metal parts in preparing them for japanning, that a sand pumice wet rolling can be obtained as follows: Place sixty pounds of small articles in a barrel of oak or iron. Make mixture of 1 part white sand and 2 of No. 0 pumice stone with water enough to make a paste so that this will roll freely in the barrel. If it is too thick it will clog in the rolling. Water must be added so that they will roll freely; use about 60 pounds of material to 20 lbs, sand-pumice mixture, and roll for 8 to 12 hours. When ready, remove the work from the barrel to wash and clean. The best way is to have a tilting barrel made of heavy mesh wire with a waterproof box on the floor so that it will receive all the mixture which can be used over again. Piping should be installed to the barrel with force enough to wash articles while rolling. The box must have an overflow with a plug on the bottom so that it can be emptied at night and the mixture will be found settled on the bottom. The barrel should be set inside of this box, which is about 8 inches high all around. An iron barrel can also be used but it must be perforated. I have found the Tolhurst dryer a good and rapid-working machine.

The gravity of japans and enamels are not the same. Some are heavy while others are very thin. Some can be reduced on the first coat 150 per cent and second coat 100 per cent. I have taken sheet steel 28 to 30 gauge, dipped it in 150 per cent reduced, 1 coat, and baked this 4 to 5 minutes up to 350°. At 350° and over the metal changes its color. I have found slow bakes give the best results, that is running up from 80° to 350° or over. Japan tumbling, however, is a very careful art, and there are no two men who work alike; it is practical experience that counts.

A New Method of Casting Brass and Aluminum in a Vacuum

An Abstract from Le Mois Scientifique et Industriel, Oct.-Nov., 1919

Written for The Metal Industry by R. E. SEARCH

The process of casting by the action of compressed air has not, until now, been available for metals or alloys that have to be cast at relatively high temperatures because the high temperatures involved cause the stoppage of the piston of the air pump by the air compressed.

Today this procedure has been modified in the sense that the metal is not only introduced into the mold by injection but also by aspiration; under the action of a vacuum of half an atmosphere, the fluid metal penetrates the mold and fills it up instanteously, thus giving a perfectly clean casting and free from pores. In order that this process should be feasible, it is necessary that the two halves of the mold shall form a hermetically sealed joint. By this method all sorts of cylinders and pistons become unnecessary. Upon its external side the crucible is provided with a suction tuyer which is directed obliquely toward the base; the other part of the crucible may be made of relatively coarse material, but capable of supporting the fusion temperature of brass or even iron.

In order to make the casting, the operation is begun by making a hermetical connection between the crucible and the mold and at almost the same time the metal is drawn into the hermetically sealed mold.

The extraction of the casting from the mold is made automatically; the only function of the workman is to keep the mold clean. As the metal is simply drawn into the mold there is no danger of an accident by the spurting of the cast metal, a danger which exists in the process of casting by the injection of compressed air.

The ordinary steel mold can produce only a restricted number of castings—1000 to 2000—because of the destructive effect of the high temperature at which the process is operated, and this restriction is a serious obstacle to the application of the process. Today by a judicious choice of material that constitutes the mold means have been found of making up to 50,000 castings of brass or aluminum with the same mold. With this process the loss in metal is small, the rapidity of the production is remarkable; in effect, with the aid of a single apparatus it may produce from 1,000 to 2,000 castings per day of eight hours work with a limited personnel, a result that would be impossible of realization with other mechanical devices.

Even a machine repeating automatically is greatly exceeded by this device from the point of view of speed. An apparatus has been constructed which has succeeded by this vacuum process in producing 10,000 bolts per hour when the capacity of the best automatic machine is limited to from 400 to 500 per hour.

Secondary Zinc Recovered in the United States in 1918*

	Short tons.
Zinc recovered by redistillation by regular smelting plants that also treat ores.....	7,931
Zinc recovered by redistillation at plants that treat only secondary material	1,987
Total redistilled	9,918
Zinc recovered by remelting, sweating, etc...	17,190
Total zinc recovered unalloyed	27,108
Zinc recovered in alloys other than brass ...	11,082
Zinc recovered in brass (estimated).....	82,400
Total	120,590

The zinc obtained by redistillation decreased from 16,835 tons in 1917 to 9,918 tons in 1918, and the zinc recovered in brass increased from about 80,000 tons in 1917 to about 82,400 tons in 1918.

The exports of zinc dross in 1917 and in 1918 were respectively, 13,302 tons and 15,816 tons.

By J. P. Dunlop, U. S. Geological Survey.

The Design Value of Decorative Motifs

Ninth Paper. A Final Review of the Application of Ornament on Form

Written for The Metal Industry by A. F. SAUNDERS, Designer, Benedict Manufacturing Company, East Syracuse, New York

In concluding the series of articles on the subject of Design Value of Decorative Motifs it is essential to emphasize the several important principles governing the application of ornament.

In the designing of an object there are two distinct phases: first the evolution of form; second the application of decoration, this distinction or division is made more for the sake of clearness; in reality the principles governing form are inter-related so closely with those covering its decoration that they govern the subject of design as a whole.

As the use for which an object is designed to serve should suggest its form, so should the form and its use suggest the character and amount of the decoration, for the artistic value of ornamentation depends as much upon the appropriation of motif as it does upon finely executed detail. Over-ornamentation, however beautiful in motif, will detract from, rather than enhance, the most gracefully proportioned form. Artistic beauty depends first upon good outline, proportionate height and breadth, then appropriateness of motif, and a proper balance between the surface decorated and that left plain. As to appropriateness of motif its importance can not be emphasized too strongly. To illustrate this let us take as an example the design motif of a tea set. Obviously one would not care for a pattern using, we will say, some form of insect or reptile life. This is not overdrawn; quite often one will see some article of tableware decorated in a most inappropriate manner, though the nation as a whole is improving in its artistic taste very fast indeed. Some of the so-called art metal work of not very many years ago would hardly receive passing notice today were it exhibited for sale.

Appropriateness of motif also means, that as a decorative feature it must be applied and treated in such a manner as not to interfere with the practical use of the object. It is quite often the case that when picking up an article to find that the ornament interferes with the handling to a degree most unpleasant. It would seem that such a fault is almost unpardonable in design. All decoration that comes in contact with the hand should be treated in low relief; this does not mean absolutely flat ornament but there should be no sharp projections. There is no excuse for inappropriate decoration. The vast stores of nature, as an inexhaustible mine, are open to the designer and from the floral kingdom, as well as from many inorganic objects, we can devise forms and decoration of exceeding beauty if we but study carefully and apply to our design work the few simple principles governing form and its ornamentation.

Ornament is called linear when it is expressed by simple lines without breadth; flat, when indicated by parallel lines dividing a plain surface, and modelled, when possessed of real or floriated relief of diversified direction; their renderings may be united in the same detail. Ornament may be accomplished by curvilinear and radiating lines, divided by variously formed spaces united either by intervening or tangential lines with or without interlacing; and by crossings and intersections. Reference to the several illustrations on plate 18 and 19 will perhaps give one a clearer idea of the meaning of these expressions than could be done in words. Next to simplicity perhaps the most important principle is that of symmetry, respecting which John Ruskin says: "It is necessary to the dignity of every form, and that by the removal of it we shall render the other elements of beauty comparatively ineffectual; though on the other hand, it is to be observed that it is rather a mode of arrangement of qualities than a quality itself, and will have no power over the mind unless it should possess all the other constituents of beauty." Symmetry has been largely employed by ornamentalists of all periods; symmetry may be absolute, or relative. It is absolute when a design is composed of devices rigorously similar, disposed inversely on each side of one or more imaginary lines termed axes. It is relative when it admits of variety in the subordinate parts; obviously the principle of variation or relative symmetry, demands more thought and subtler handling than is required in absolute symmetry. The Italian

PLATE 18.

1. Linear ornament applied to form of curvilinear surface. 2. Flat ornament applied to form of curvilinear surface. 3. Modelled ornament applied to form of curvilinear surface. 4. Example of simplicity of decoration and proper division of surface. 5. Example of over-ornamentation.

PLATE 19.

1. Symmetrical arrangement of ornament, absolute symmetry. 2. Symmetrical ornament, absolute symmetry. 3. Symmetrical arrangement of ornament, relative symmetry. 4. Unsymmetrical arrangement of ornament.

Renaissance and the Louis XV styles are good examples of the application of absolute and relative symmetry, Plate 19.

Next in importance is the division of surface. The general form being duly considered, should be divided and ornamented in leading lines on the face of the work, either slightly sunk, flat or in relief, depending upon the use for which the object is intended. Having divided the surface to be decorated into principal sections, one must next consider the kind of effect he wishes to produce, and allow for the relative position of all the numbers so as to obtain a clear, well-proportioned and harmonious whole. These principles as will be observed, are the same which regulate well-proportioned form. Hence height division should only be applied to symmetrical, pentagonal and round forms, or surfaces with rectangular outlines, each member or section affording a similar development.

Height division may be used in conical forms affording gradual regular contractions, of frequent occurrence in vases, candlesticks, handles, etc.; care must be taken to follow the scale graduation of the outline, while width division may be associated with forms of continuous outlines or rectangular surfaces, presenting regular or uniform outlines. Such an arrangement is seen in circular discs, in panels and other like forms, where in each member is but a repetition of the other. One must above all things avoid uncertainty of expression and meaning in the division of surfaces; this holds true whether one adopts a symmetrical, unsymmetrical or alternating mode of ornament. Division of surface leads naturally up to the principle of order which should prevail in decorative art, and the fitness of ornament to its scale and position. Thus, square, rectangular or elliptical forms should be treated differently; ornament appropriate to flat surfaces if applied to conical shapes, will lose part of its charm and peculiar character from the mere fact of its misplacement. Hence it is necessary that the designer should compare and study every decoration in view of one particular form. If we turn to flat surfaces, such as rectangular panels, wherein the ornament alone is unsymmetrical, we find that the prevailing dimensions should be vertical, and the main lines of the decoration and general arrangement run parallel to the leading outlines of the panel. This would of course be reversed in a panel with horizontal lines, while a square panel having all its sides equal, is not governed by any directing or guiding influence.

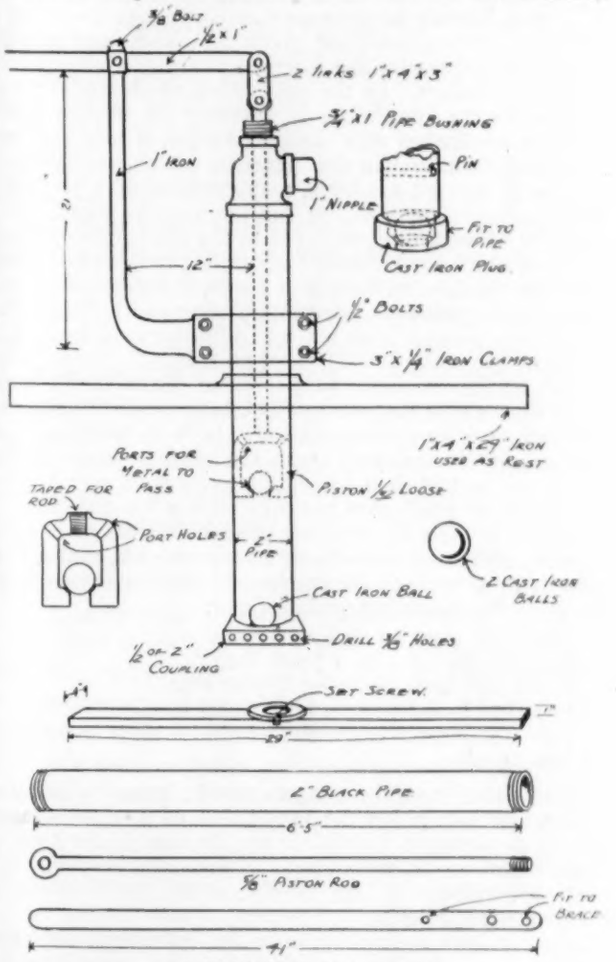
Decorative forms in relief present an immense variety of curves and scrolls, yielding great richness of effect. Simple curvilinear surfaces with convex or concave outlines admit of rich decoration, but care must be exercised in the selecting of ornament that will readily adapt itself to the irregular outlines of such shapes. In conclusion it should be remembered that a knowledge of the laws both of form and of decoration will raise the standard of any work from the lowest grade of industry to the highest standard of art. Common sense and the inherent feeling in man of a striving after the beautiful, will be the best counsellors in the selection and application of decoration.

Although the foregoing articles have been more or less limited, to keep the series within the confines of the pages of a magazine, it is hoped by the author that they have served the purpose intended, of explaining the value and helping the layman to understand the motifs in decorative design.

A De-leading Pump

Written for The Metal Industry by C. W. ROSENBERGER, American Can Company, Toledo, O.

The accompanying illustration shows a rough sketch of a Lead Pump that has been used for the last fourteen



A PRACTICAL LEAD PUMP.

years and by which 5,000 pounds of lead have been removed from a kettle in less than two hours.

This pump can be set up at a very small cost and will last for years with an occasional burning out of hardened dross within.

It should be laid on the side of kettle for a few hours to be thoroughly warmed, then submerged into the spelter working the handle to get it moving up and down, then raised and set down in corner of kettle, the first five or six ladles full to be poured back into the bath. After that the lead begins flowing. One can tell it by the color.

One plater states that for steel he uses one part sulphuric and ten parts water cold. For extremely rusty work he uses one part muriatic and one part water at 100 degrees. He then runs it through a bath of hydrated lime.

Another, however, points out that where sulphuric acid is used in pickling, lime should not be used to neutralize since calcium sulphate, almost insoluble, would thus be precipitated into pores of work and cause trouble. Caustic soda can be used after sulphuric pickle since the sodium sulphate formed in neutralizing is soluble.

The Foreman Plater

A Man to Man Talk on His Duties and Opportunities

Written for the Metal Industry by JOSEPH WALKER, Electroplater

If you haven't perseverance and grit you cannot be a foreman electroplater, but given the ability and energy, the opportunities for the foreman plater are better today than ever before. In the past, when electroplating was limited to the knowledge of scouring the objects clean, and the production of a change of color, it required only a "hand" to attend to the batteries, which was the only source of current available, and solutions of a pint or a few gallons were sufficient for the average plant. The number of men, too, employed in the plating department was not much more than a corporal's guard, and, because of a limited demand for plated goods, the plater alone had to do all the polishing, scouring, plating and buffing. Today electroplating is an entirely different vocation. It is no more the work of a "Jack of all trades." Every Tom, Dick and Harry cannot be a foreman plater, for he must be a man above the average in intelligence. The largeness of American industries today with its hundreds and thousands of employees make the opportunities for the proficient and efficient foreman greater than ever before. No trade or profession requires such a variety—such a combination—such a complex of requirements as electroplating. Not only must he be an expert—a specialist in a particular branch of electroplating, but must possess in addition the following qualifications:

First: He must be an honest man.
Second: He must be a sober man.
Third: He must be an intelligent man.
Fourth: He must be an economical man.
Fifth: The most important of all, he must know how to handle men.

Manufacturers and managers usually know the amount of cost necessary for the production of a given output in any department, but this is not the case in the plating department, as an incompetent or dishonest foreman can ruin an otherwise strong institution and the firm might never know the cause.

Neither can a drinking man be entrusted with the management of a department. He must know how to manage help; to reduce overhead charges (unnecessary expense) to a minimum. This does not necessarily mean to get the most work from your men for the least possible pay, always remembering "The laborer is worthy of his hire," and treat both employer and employee with equal justice. In all my experience in foremanship, covering a period of some thirty years, I have not found two men to produce alike, and that means that no two men are worth the same. The up-to-date foreman always takes pride in the quality of his electroplate, regardless of wages paid him, and he will impart his knowledge and help his assistants as much as possible. In the past the foreman plater would hide and shroud in mystery his supposed superiority and secrets of electroplating like the tales of the "bogyman" to a babe.

The stupid accusations by the incompetent, the wail and cry that the "Soulless Corporations" and the "Heartless Capitalists" are forever looking for a cheaper man, that by withholding his knowledge from the apprentice and assistants he diminishes the possible chances of their promotion and possible competition for his own job as foreman, are false. A foreman of this kind has another think coming to him. Does he think that when he dies his knowledge with him too will die? And when he dies, the apprentice too will die, that the employer also will give up the ghost? Whether you live or die, the world will go on and continue in its course.

We who are foremen and employ helpers, assistants and apprentices, must realize that the boy who wants to "get there," the boy who really wants to learn that all the hosts of evil spirits from the regions below cannot keep down in this kind of boy the American spirit—I WILL.

No greater service can man render to his country, no greater glory nor fame, no greater pleasure in life can man enjoy than the knowledge that he helped this or that boy to a better and higher life. When I die I want on my tomb-stone written:

"A FRIEND OF THE BOY."

In this enlightened and progressive age is it possible that we still have men who would crush and stifle a being made in the image of God. The foreman who would not only refuse aid but hinder the progress and development of his subordinates is a fit subject for the firing line, and the sooner the firm finds it out and gives him his passport, the better for both. The foreman with not enough humanity in him to give his helpers a lift—encouragement and instructions—needs only two more legs to make him a quadruped—a member of the animal tribe.

The foreman in whom the firm places their confidence and trust must regard their interests as his own. It is his duty to guard against any and all possible loss of business and improve the ability and skill of his subordinates that in case the foreman is taken ill that his department should be able to go on that the firm should not suffer a monetary loss because of his absence. This kind of foreman need not be afraid of losing his job. His job will be kept for him, not through a sense of charity, but because it is a good business policy. The competent electroplating foreman need not hesitate to teach his assistants for fear he will take his job because the assistant will work for less. In all my experience I have never found them looking for a cheaper man, as is the false hallucination of so many foremen. Of course, there are exceptions to all rules. This might have existed in the past. The commercial principle and foundation of good methods as conducted in America today is based not on cheapness but on quality of product. The country suffered not so much from the high cost of living or the cost of high living, but from the high cost of cheap labor. Quality, not cheapness, is the demand today.

To sum up the necessary qualifications for a progressive, competent executive of an electroplating department it is necessary to convince the firm at the very beginning of your honesty, sobriety and ability so that they may have confidence in you and respect your judgment. The incompetent physician may diagnose your ailment wrongly and may possibly prescribe the wrong medicine and treatment and you won't know it. The incompetent pharmacist may compound the wrong ingredients or improper proportions called for in the doctor's prescription and you won't be the wiser. The shyster lawyer may give you the wrong advice and you won't know any better. The baker, the shoemaker and the candlestick maker, nearly all the trades and professions except the plater, can fool the public or the employer with incompetence or bluff, but not so with the electroplater. The electroplater cannot hold his job by fooling the employer with inferior plating, for he will be weighed and found wanting.

EDITORIAL

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METALS IN THE NAVY

Of deep interest to all users of metals is the presidential address of Engineer Vice-Admiral Sir George Goodwin, K. C. B., LL.D., the new president of the British Institute of Metals, at the open meeting March 11th, 1920, at London. He touched upon various metals in naval construction, as they are being used in the British Navy, making clear, as an authoritative spokesman for the largest user in the world of non-ferrous metals, that it was necessary for the navy to demand the very best metals and alloys that can be produced in almost every case. In fact if still better materials were available they would be used. One problem which is before naval engineers, and has been before them for over thirty years, is "the reduction of machinery weight with the reduction of fuel consumption and increased durability and reliability." At one time this condition did not exist. Speed was not of the importance which it is at present, and in fact naval vessels were distinctly inferior to merchant vessels in this respect. Later, however, speed was recognized as an essential condition of naval warfare, and since then the demand has never ceased for higher and higher speeds. This has resulted not only in the enormously increased power of machinery, but in a greatly reduced weight of machinery. Reliability, of course, had to follow, as without it there could have been no advance.

Sir George Goodwin stated that the most important use of metals was in condenser tubes. The present tubes are highly satisfactory except that a little more freedom from corrosion would be desirable. The corrosion committee is investigating this problem thoroughly and has so far turned in five reports. According to their suggestion a set of pre-oxidized tubes were fitted in one condenser of a patrol vessel for comparison with a similarly manufactured set fitted in the other condenser, but without having been pre-oxidized. So far no difference of sufficient importance to allow comparison has resulted. The general opinion, however, seem to be in favor of pre-oxidized tubes.

Specimens from the ships of the German Navy were obtained and examinations gave most interesting data. A noticeable feature of the samples examined was that most of the tubes were either tin or lead lined. Tinning was common British practice some years before when the circulating water was outside the tubes, and, as tinning the external surface was a comparatively simple matter, the life of the tubes could be greatly prolonged. However, coating the interior of a long tube of small diameter with either tin or lead is much more difficult; the smallest uncovered spot

would permit very rapid corrosion, and greatly reduce the life of the tube. In the latest example obtained from one of their newest light cruisers of the Germans there was no such lining or coating and the tubes were practically of the British Admiralty composition with a very small quantity of iron. The limitations of the different types of materials which could be applied to condenser tubing were, of course, a large factor in making the problem difficult. It is not enough for the mixture to be non-corrosive. The metal must be capable of being drawn, it must conform to the naval specifications, and at the same time not be too expensive.

Another problem is that of turbine blading. For a number of years turbine blades were made of brass because of the ease of manufacture. The peripheral speeds and therefore, the stresses, were low. However, with the advent of impulse turbines increase of temperature and the increased speed necessary made it impossible to use ordinary brasses, as they fell off rapidly in strength at high temperatures. Phosphor bronze blading was introduced for the high pressure end of such turbines, which had an ultimate strength of 46,000 pounds per square inch at ordinary temperatures, and 41,400 pounds at 440 degrees F. This was, of course, much better, but the material is still sought which will give higher tensile strength so that higher peripheral speeds can be obtained or the turbine weight could be reduced by cutting down the size of blade scantlings.

So far steel has been used only with a thin coat of nickel drawn over the blade, (the Ferranti method), but this system is suited only to blades of uniform sized sections. The only remedy seems to lie in a non-ferrous metal. In connection with just such problems Dr. Rosenhain has done considerable work with aluminum bronze; sample castings have been made up and are awaiting an opportunity to be tested.

The increasing use of superheat brings in new problems of the capability of the old tried materials to withstand the higher temperatures.

Another problem is that of propeller blades. The standard material for a number of years has been manganese bronze, but there is the standing objection to this material of its great cost. Other alloys have been tried, but so far unsuccessfully. It must be borne in mind, however, that for propeller blades, as in the case of condenser tubes, there are many other requirements to be met besides freedom from corrosion.

The problem of bearing metals has lost a great deal of the importance that formerly belonged to it because the true principles of lubrication, so long known but not utilized, have now been applied. The successful maintenance of an oil film between the rubbing surfaces has overcome a large part of the bearing difficulties formerly experienced. Some work of great importance, however, still remains. There are times when lubrication fails, and at such times everything depends upon the bearing metal, which should be of such material as to tide over the critical period.

A final example was the use of alloys in the oil engine. It seems that a limitation had been set for some time to the piston speed, because of the high inertia stress caused by the weight of the reciprocating parts. This limitation has to a large extent been removed by the use of aluminum alloys for the pistons.

Sir George Goodwin, urged that the metallurgist get into closer touch not only with the manufacturers, with whom they had always been in fairly close connection, but with the engineers who could therefore use more directly than before the information that metallurgists gave them. This would require, of course, that the metallurgists should become acquainted with the engineers' requirements and that they should educate themselves in the principles of engineering. In addition he suggested that there should be more papers presented before the institute by manufacturers and engineers; that a larger proportion of the communications should be of a practical rather than of a purely scientific type, if for no other reason than that it would open a considerable field for the work of the metallurgists and broaden their outlook. He urged co-operation between manufacturers, engineers and metallurgists.

ALUMINUM SALES CONTRACTS

A suit was brought by the Brown Bag Filling Machine Company against the United Smelting and Aluminum Company, for a breach of contract to buy rod aluminum. It appears that in February 1916 these parties entered into a contract by which the United Smelting and Aluminum Company was to buy 34,078 pounds of aluminum rods at 80 cents per pound; 1490 pounds had been received and accepted when the United Smelting and Aluminum Company refused to accept the balance claiming that the rods were not pure aluminum and setting up a counter claim for damages. The controversy, therefore, hinged about the point of whether the contract called for commercial aluminum rods or for pure aluminum, and whether the United Smelting and Aluminum Company by accepting one shipment gave up its right to reject the remainder.

When this case was first argued before a trial court, the jury gave its verdict for the plaintiff, the Brown Bag Filling Machine Company. The case was appealed and tried before the Supreme Court of Errors of Connecticut. This court set aside the judgment and remanded the case because of an error by the lower court, in instructing the jury that it might take into consideration the experience or lack of experience of the parties in the aluminum trade, in judging the meaning of the words "rod aluminum" in the contract. It was claimed that this language would mislead the jury to the injury of the defendant, as tending to excuse the plaintiff for his lack of knowledge if otherwise the facts should turn out to be to his disadvantage. Also the court directed the jurors to consider the letters which bore on the construction which the parties had taken of the contract, which were stated to be self-serving letters and

not a practical construction of the contract. These letters had been a great help to the plaintiff, and because there was no other point of misunderstanding than that of the meaning of a technical trade term, the Supreme Court held this to be erroneous.

Another point of decided interest to the trade is the fact that it was made clear that the acceptance of a part of the goods of an order could not legally prevent the buyer from rejecting later deliveries which did not live up to the terms of the contract.

GOLD FROM BASE METALS

We quote the following from the New York Times of March 13th, 1920.

"'The alchemists' dream of producing gold from base metals is not extravagant,' asserted Professor Frederick Soddy, head of the Physical Chemistry department of Oxford, in a recent publication. He tells how to do it.

"'To get gold from mercury,' he says, 'expel from the atom of mercury one beta-particle, which will make thallium; then one alpha-particle, which will turn the thallium into gold. Or, to get gold from lead, expel from the atom of lead one alpha-particle, which will turn it into mercury, and proceed as before.'

"Investigators are already working along these lines."

A thousand years ago this was the dream of every chemist in Europe. Since that time it has long been laid away and any such statement twenty-five years ago would have raised a storm of ridicule. Subsequently, however, radium has been discovered and the fact that radium in its decomposition gives off, among other things, helium; also that radium itself may be a decomposition product. Although this seems to contradict the accepted understanding of the term "element," it is a fact that through the discovery of radioactivity, the theory which had been held for some time was proved, that the elements were not absolutely basic, but were simply combinations, which we had up to that time been unable to subdivide further.

To be sure we must accept with considerable reserve any newspaper report on very technical problems. We have very grave doubts about the ease with which beta and alpha particles will be expelled from the above mentioned atoms of mercury and lead. Nevertheless, it would not be safe to make a definite and flat statement that such a thing is impossible or never will be done. Too many impossible things have been accomplished, too many scoffers have become the targets of boomerangs which they themselves released, for any of us to venture any decided prediction.

SAFETY IN A LARGE PLANT

The Safety and Factor Hygiene Department of the Ford Motor Company, Highland Park, Mich., has just emerged from another year of accident prevention work, with the record of but one fatality among nearly 50,000 workmen. Had every industrial plant in the country accomplished this proportionately, there would only have been approximately 760 deaths by accidents, instead of the 22,000 or more that occurred. Their previous year's (1917-1918) report shows three deaths.

The reduction of lost time accidents in this plant in the last three years is strikingly brought forth by a comparison of the months of October 1916 and May 1919. During that period they were reduced from 194 to 40, nearly 80%, notwithstanding the fact, that there were several thousand more employees working in the plant.

The Safety and Hygienic Department which has all such work in charge consists of four general inspectors, five special inspectors highly skilled in their particular work; one stenographer, two educational men, one bacteriologist, and one hygienic man, with seven men to clean drinking fountains twice each day, and spray disinfectants throughout the plant. Accidents are investigated by the general and special inspectors, and remedies applied when possible. There were approximately 2,700 orders and communications issued and completed to prevent accidents during the past year.

CO-OPERATION IN TORRINGTON

A co-operative selling organization that promises to help the factory workers of Torrington, Conn., to reduce their living costs anywhere from 10 to 15 per cent. has been established in that town. The organization is the Community Co-operative Company, incorporated with a capital of $150,000, with $75,000 paid in. Nearly 1,500 factory employees and other workers subscribed for the shares, which were sold at $50 each. No one person is permitted to hold more than four shares.

The company has already purchased a valuable piece of property in the business section of the town, and a store is to be opened there this month. Pending the completion of the new store building, a temporary sales structure is being used. The first thing that the company tackled was the sugar problem, the shortage having become acute in Torrington. Through the efforts of Julian M. Palmer, manager of the company, four carloads of sugar, nearly 175,000 pounds, were secured and placed on sale, with the result that there is no longer a sugar shortage in Torrington. A wide variety of products is now being handled.

The company is not being operated on the plan followed by most of the factory co-operative stores—that of selling at cost. The products are offered at figures slightly above cost and the profits will be returned to the shareholders.

James H. Graham, general manager of the Torrington Com-

JULIAN M. PALMER.
Manager, Community Co-operative Company, Torrington, Conn.

pany, was the originator of the co-operative store plan in its local application. Representatives from Torrington were sent out to investigate co-operative stores in New England and the middle western states. Comparisons of different organizations were made, the best features being adopted and others rejected until an organization suitable to Torrington and its needs was evolved. Julian M. Palmer, who has had close to 40 years' experience in various branches of the wholesale and retail business, was engaged to manage the new company, and under his capable and experienced guidance the plans are being worked out smoothly and there is every indication that the company will not only be highly successful as a business organization but will also be a valuable factor in aiding the worker to meet the high cost of living.

The president of the co-operative company is Walter Harrison, an employee of the Coe Brass Branch of the American Brass Company. The other officers are Jacob Lakin, vice-president; David Lindsay, secretary; and E. T. Overton, treasurer. Each factory in Torrington is represented on the directorate, which is as follows: Eugene I. Bartram, Torrington Manufacturing Company; John W. Whalen, Turner & Seymour Manufacturing Company; Henry J. Healey, Excelsior plant of Torrington Company; Robert R. Richard, Progressive Manufacturing Company; Asa H. Wilcox, representing the general group outside the factories; Walter Harrison, Coe Brass Branch of American Brass Company; Jacob Lakin, Hendey Machine Company; David Lindsay, Union Hardware Company; and E. T. Overton, Standard plant of Torrington Company.

The exact ideas of the incorporators are set forth in the following statement issued by them:

"The co-operative store is not designed as a cut-rate store. When an established price of an article is necessary to pay a reasonable living profit, this price will be maintained. In those instances, however, where an abnormal profit is made, it is the intention of the company to take such steps as may be necessary to correct inflated values. The company is not intending, nor will it encourage, the 'knifing' of any competitor solely for the purpose of competition."

As a result of the success that has attended the initial efforts of the company, steps are being taken by factory workers in other manufacturing plants in this section of Connecticut to organize co-operative stores along similar lines. Thomaston has organized a company and Waterbury is falling in line.

GOVERNMENT PUBLICATIONS

Bulletin 150. Electrodeposition of Gold and Silver from Cyanide Solutions, by S. B. Christy. 1919. 171 pp., 8 pls., 41 figs. 25 cents.

An account of experiments that were carried on for a number of years by the writer for the purpose of ascertaining the most efficient method of precipitating gold and silver from cyanide solutions by the use of electricity.

Bureau of Standards, Scientific Paper No. 352, "Thermal Expansion of Insulating Materials."

The present paper gives data on the thermal expansion of some of the more important insulating materials.

In most cases the expansions are too irregular to justify the use of the general quadratic equations.

A knowledge of the thermal behavior of these materials is essential before assembling them in certain types of apparatus subjected to wide temperature variations.

Scientific Paper, No. 342, Bureau of Standards. Reflecting Power of Stellite and Lacquered Silver, by W. W. Coblentz, Associate Physicist, and H. Kahler, Laboratory Assistant, Bureau of Standards.

The object of the present paper is to give data on the reflecting power of the latest production of Stellite and also of lacquered silver mirrors. It is shown that the reflectivity of Stellite varies somewhat in the visible spectrum depending upon the homogeneity and no doubt upon the exact composition of the alloy.

Data are given on the reflecting power of lacquered silver mirrors, before and after exposure to ultra-violet light. It is shown that owing to photochemical action in the lacquer the silver is turned brown in color, thus reducing its reflecting power.

Technological Paper No. 139, Bureau of Standards. Some Tests of Light Aluminum Casting Alloys; The Effect of Heat Treatment, by P. D. Merica, Physicist, and C. P. Karr, Associate Physicist, Bureau of Standards.

The mechanical properties of a number of different compositions of cast light aluminum alloys have been determined as well as the resistance to the action of alternating stresses of three commonly used alloys. Comparison was made of the resistance of some well known alloys to corrosion in the salt spray test.

It was found that the effect of heat-treatment of cast alloys, consisting of annealing at 500 deg. C and cooling air from that temperature, followed by aging for several days before testing, produce an increase in the tensile strength and the hardness, with an attendant decrease, usually, in the elongation. The application of such a heat-treatment to light aluminum castings seems to have commercial possibilities.

Technological Paper No. 137, Bureau of Standards. The Coking of Illinois Coal in Koppers Type Ovens, by R. S. McBride, Engineering Chemist Bureau of Standards, and W. A. Selvig, Assistant Chemist, Bureau of Mines.

The Bureau of Standards was ordered by the Administration to conduct an investigation of a new coke oven process suited to utilization of by-products. The test demonstrated that some Illinois coals can be coked in the Koppers Type Oven without radical change in operating methods for producing coke for use in blast furnaces. The yield of gas and by-products from the Illinois coal is proved excellent both in quantity and quality. The Bureau of Mines was responsible for the sampling and weighing, including the handling of the coke, analyses of coal, etc. The subject of costs was not discussed in the report, since this depends upon local conditions.

Scientific Paper, No. 347, Bureau of Standards. The Heat Treatment of Duralumin, by P. D. Merica, Physicist, R. J. Waltenberg, Assistant Physicist, and H. Scott, Assistant Physicist, Bureau of Standards.

A study was made of the heat treatment of alloys of the type of duralumin and the effect on the mechanical properties observed of variations in the various heat-treatment conditions. Conclusions are drawn relative to the best conditions for commercial heat-treatment of this alloy.

A theory of the mechanism of hardening during aging of Duralumin is proposed which is based upon the decreasing solubility with decrease of temperature of $CuAl_2$ in aluminum. The precipitation of this compound, suppressed during quenching, proceeds during aging, and takes place in highly dispersed form. To the presence of this highly dispersed constituent is due the hardness of the aged alloy.

Technological Paper No. 132, Bureau of Standards. Mechanical Properties and Resistance to Corrosion of Rolled Light Alloys of Aluminum and Magnesium with Copper, with Nickel and with Manganese, by P. D. Merica, Physicist, R. G. Waltenberg, Assistant Physicist, and A. N. Finn, Associate Chemist, Bureau of Standards.

Light alloys of three ternary series: Aluminum-magnesium-copper, aluminum-magnesium-nickel and aluminum-magnesium-nickel, were rolled into sheet and tested in cold-rolled condition, after annealing and after heat treatment. The resistance to corrosion in the salt spray test was also investigated.

The alloys of the first series were superior in all conditions to the others in respect to mechanical properties, but were not as resistant to corrosion on the whole as the alloys of the last series. The heat treated alloys of the first series are but little inferior in resistance to corrosion to the alloys of the last series.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ALUMINUM CASTING

Q.—Could you give me through your journal a solution for filling holes in aluminum castings. We are making vaporizers and some come porous now and then.

A.—These defects are generally taken care of by soldering. The defective part is made hot with a blowpipe and a bar of solder of 55 zinc, 40 tin, and 5 aluminum, about ⅜" in diameter is held up and a gas flame turned on it so the solder will drip from the inside. Do not use the outside surface. The drippings are rubbed over the defective part with a tool and solder very nicely, and where no machining is necessary there are no objections if you take your casting before it is cold, such as in the case of pattern plates, where it can be soldered without heating. —W. J. R. Problem 2,800.

ALUMINUM FROSTING

Q.—We are at present manufacturing aluminum screw caps and have been having a great deal of difficulty in the frosting process. We have tried caustic soda, but with very poor results, as the fumes are almost unbearable.

A.—The following process will give you the desired finish: Remove the grease and dirt from the article by dipping in benzine. To produce a frosted surface the cap should be dipped in a strong solution of caustic soda or potash and then in a solution of undiluted nitric acid, then washed thoroughly in water and dried in hot sawdust. The sawdust must be a fine dry grade with no rosin or pitch that will streak the surface.

The only way to avoid the ill effects of fumes is to place a hood above the caustic tank with a strong draft to carry off the noxious vapors.—C. H. P. Problem 2,801.

ALUMINUM PLATING

Q.—Under separate cover we are sending you a sample of an aluminum die casting that is to be nickel plated. We have had a great deal of trouble in getting a satisfactory finish for same and would like to get a formula that you would recommend. Our great trouble seems to be that we cannot get a good heavy plate.

A.—For plating aluminum, clean and polish in nitric acid solution, then immerse in iron dip

Water	1 gallon
Chloride of iron	1 ounce
Muriatic acid	½ ounce

Plate in nickel solution consisting of

Water	1 gallon
Single nickel salts	8 ounces
Magnesium sulphate	3 ounces
Boracic acid	1 ounce
Common salt	½ ounce

Temperature, 80 degrees Fahr. Four volts.—C. H. P. Problem 2,802.

AMPERAGE REQUIREMENTS

Q.—Would you kindly advise us what capacity (in amperes) dynamo would be necessary to operate the following:

1-330 gallon Nickel Solution
1-450 gallon Nickel Solution
1-225 gallon Silver Solution
1-70 gallon Silver Strike Solution
1-225 gallon Cyanide Copper Solution

We now have a six volt 150 amp. machine, would it be advisable to install an added machine, or have one machine operate the entire plating department? What dynamo is best adapted for general job plating?

A.—The letter does not give the right kind of information to enable us to answer the inquiry correctly, because the size of the dynamo for plating purposes depends entirely on the square feet of surface which it is proposed to plate at one time, and it is not very accurate to give us the number of gallons of solution, because with this same size of solution, if very small articles are plated, only a small current would be used, but taking the matter as an average condition, you should have for the:

330 gal. Nickel Solution	about 125 amps.
450 gal. Nickel Solution	about 150 amps.
225 gal. Silver Solution	about 15 amps.
70 gal. Silver Strike Solution	about 10 amps.
225 gal. Cyanide of Copper Solution	about 125 amps.
Total	425 amps.

For these tanks on ordinary work, we would suggest a generator of 500 amperes, 6 volts.—C. G. B. Problem 2,803.

CORE BOX METAL

Q.—We understand that there is a metal used for making core boxes that is a great deal lighter than regular brass or iron boxes and that there is no shrinkage to it, and which seems to free the cores very easily. We understand that this metal looks something like what is termed "White Metal." Any information you may be able to give us in this connection will be greatly appreciated.

A.—There is a mixture of 55 tin, 45 zinc, poured so it will not burn a stick of wood. This metal is lighter than brass or iron and will not shrink.

We would not consider this a very economical core box material. Cast iron properly designed is the best and cheapest for core boxes.

The following mixture makes a good light core box:

87	Aluminum
12	Copper
1	Iron

Another possibility is

80	Tin
20	Antimony

if the mixture is not too expensive.—W. J. R. Problem 2,804.

FINE LEAD SHOT

Q.—Please let us know how fine lead shot is made?

A.—In regard to method of making fine lead shot, there is no other practicable way in which these can be made, if you wish to have them spherical, than by the use of a shot tower and subsequent sorting. If you simply wish to have very finely divided metallic lead, this can be prepared by so-called atomizing process; that is, by having a jet of steam or other gas under pressure impinge against a stream of molten lead, and collecting the resulting finely divided material.—A. B. Problem 2,805.

GOLD AND SILVER PLATING

Q.—We have started a Horological School along with our manufacturing jewelry business and we would like to get a recipe for one quart gold and one quart silver solution. Would it be possible for you to give us the correct proportions using trisalyt.

A.—We would suggest that you purchase gold and silver trisalyt to prepare your one quart gold and silver solution. Trisalyt is a combination of sodium cyanide, gold or silver cyanide and sodium sulphite, and so contains all the essential factors for either solution and their upkeep.

Formula for 1 Quart Gold Solution.

Distilled Water	1 quart 160 deg. Fahr.
Gold Trisalyt	1/5 oz.
Sodium Cyanide	1 pennyweight
Phosphate Soda	⅛ oz.

Use 24 karat anodes. Voltage 2 to 2½.

Formula for 1 Quart Silver Solution.

Water, distilled	1 quart
Silver Trisalyt	2 ozs.
Sodium Cyanide	1/3 oz.
Ammonium Chloride, powdered.	⅛ oz.

Temperature normal. Voltage 1 to 1½. Use fine silver sheet as anodes.—C. H. P. Problem 2,806.

GREEN AND YELLOW GOLD

Q.—We have been having some trouble with our green gold solution. Every time we try to use it we have to build it up. Can you give us a formula for a good green gold that will stand up and still give us a rich green color.

Also a rich yellow gold, as we have been trying to match some colors and cannot seem to get them.

We have made a gold solution as follows:

Water	1 gallon
Cyanide	5 ounces
Chloride of gold	10 dwts.

and it does not seem to give a good color.

A.—Green gold solutions are more difficult to maintain than ordinary gold solutions. The anodes should always be equal to 18 karat, composed of fine gold and silver. When such anodes are used the solution can be maintained more constant. Green gold solutions should never be run at a temperature exceeding 100 degrees Fahr.

The following formula will produce an excellent light green gold:

Water	1 gallon
Gold trisalyt	200 grains
Silver trisalyt	72 grains
Bitartrate of potassium	24 grains
Sodium cyanide	3 to 4 ozs.

It is necessary to use a higher voltage than with an ordinary gold solution; four volts and upwards.

If you dissolve your chloride of gold direct in sodium cyanide you will never get a rich yellow. It should be converted to a fulminate by precipitating with aqua ammonia. Then filter and wash the precipitate, and finally dissolve in sodium cyanide.

The following formula based upon gold trisalyt, which is practically a gold cyanide, gives excellent results:

Water	1 gallon
Gold trisalyt	½ ounce
Sodium cyanide	⅛ to ¼ ounce
Phosphate of soda	½ ounce

Temperature 160 deg. Fahr. Voltage 2 to 2½.—C. H. P. Problem 2,807.

HOT GALVANIZING

Q.—When galvanizing articles, we do not seem to be able to get spangles formed on the articles. Epsom Salts seems to have no effect. The spelter seems raw and hard to brush. This trouble appears to be confined to one kettle, as the other kettles respond very readily upon treatment.

A.—Your galvanizing kettle is too hot, which will destroy the spangles you mention. As to Epsom Salts, I must confess it is a new one to me, as I never heard of it being used for making "spangles." You do not state the treatment to which the other kettles respond. If you can send us a little more detailed information we will be able to help you further.—J. H. V.

The suggestion of galvanized kettles being too hot, thus destroying spangles, has been found true.

As to the use of Epsom Salts, let me state that by spreading same lightly over the Salammoniac Flux or mixing a small handful with the glycerine that is used to give the flux a firmer body, also thus diminishing the amount of Salammoniac used, it tends to give the ware a white appearance, spangles running closer together, and the ware holds its color much longer. As you know, some spelter upon the market today gives the ware a bright glossy appearance, that is the lower grade spelter, and to overcome this Epsom Salts are used—Questioner.

I have tried the Epsom Salts treatment and have found nothing in it.—J. H. V. Problem 2,808.

RECLAIMING

Q.—The writer being a subscriber of your magazine, would deem it a favor if you were to give us information as to the practice used in reclaiming brass from polishing material, such as is to be found in exhaust pit. We exhaust, from our polishing lathes, along with the brass grindings, of course, a quantity of buffing materials. emery and other foreign matter. We experience considerable difficulty in disposing of this material from the pit at all, although we know that there are many valuable pounds of brass in the pit, could we reclaim it? Is there any method that you would suggest, without, of course, the installation of a separating machine, that we could adopt to reclaim this metal?

A.—It is entirely possible to reclaim the brass from your exhaust pit, but not, as you state, without the installation of a separating machine, unless the proportion of metal is 80 per cent or more, which we should judge rather unlikely. The best way for you to reclaim the brass is to concentrate it in a gravity concentrating machine, and then smelt the concentrates in a reverberatory furnace. Moreover, if your grindings and waste materials are very fine, as they very likely are, it might be necessary to briquet before smelting in order to avoid undue flue dust loss.—A. B. Problem 2,809.

ROSE GOLD

Q.—Please send me a formula for a Rose Gold solution.

A.—If a cheap Rose Gold is desired then it is advisable first to plate the articles in a copper solution to produce a "smut."

Copper solution should be prepared as follows:

Water	1 gallon
Sodium Cyanide	3½ ozs.
Copper Cyanide	3 ozs.
Bicarbonate Soda	1½ ozs.

Voltage 3½. Temperature of solution 120 deg. Fahr.

Plate the article for a few minutes until a deep red copper color is obtained, then wash in water as usual, and remove the copper smut from the high relief parts with bicarbonate of soda.

The articles are then ready for the base gold.

Prepare a gold solution as follows:

Water	1 gallon
Gold Trisalyt	1½ ozs.
Sodium Cyanide	⅛ oz.
Bisulphate of Soda	⅛ oz.

Temperature of solution 160 deg. Fahr. Voltage 2½.

All that is necessary for the cheap finish is to give a flash in the gold solution.

If a pure Rose Gold is wanted then omit the deposit of copper. Plate articles in the gold solution for a minute or two at a high voltage, six to eight volts. This voltage will give a deep red gold. Then remove, wash and relieve the high lights with sodium carbonate and plate for a second or two with the voltage reduced to 2 or 2½ volts. The background of the articles should then be a deep rose and the high lights a uniform yellow.

The proper method of introducing boracic acid in a nickel solution is to dissolve the material in as little boiling water as necessary for solution, and afterwards mixing thoroughly with the nickel solution. The addition should be made in the evening after the days work is finished. The nickel solution can then be stirred up thoroughly so that the boracic acid will become throughly mixed in the solution. By the following morning the solution will have settled and become clear again. Boracic acid crystals should be used in preference to the powdered material.—C. H P. Problem 2,810.

SILVER DIP

Q.—Please send us a solution for a silver dip.

A.—Silver dip formula is as follows:

Water	1 gallon
Silver Trisalyt	½ oz.

Temperature 160 deg. Fahr.

Water	1 gallon
Sodium Cyanide	⅜ oz.
Silver Cyanide	¼ oz.
Sodium Sulphite	⅛ oz.

In silvering a cold solution should be used. First by using

Water	1 gallon
Silver Trisalyt	¼ to ½ oz.

This solution should be used cold. Immerse the bright acid dipped and cleansed articles in the cold silver dip first. They should turn only slightly perceptibly white. Then immerse direct in the hot silver solution.—C. H. P. Problem 2,811.

SILVER PLATING

Q.—Some time ago you sent us a formula for a silver solution. We prepared a one gallon solution and upon experimenting with a few articles we find that same come out very dull and the solution appears very unclear. The formula is as follows:

Water	1 gallon
Sodium Cyanide—98-99%	4¾ ozs.
Silver Cyanide—80½%	4 ozs.
Sodium Sulphate	½ oz.

We take the following proceedure in mixing same; we dissolve the sodium cyanide and the sodium sulphate in warm water and pour same into a receptacle and into that receptacle we add the silver cyanide. We use 2 volts.

Is the above method correct? Will you also kindly inform us whether brass must be copper plated before being silver plated.

Will you kindly let us know what the above solution lacks as we want the articles to come out bright.

A.—Silver solutions occasionally when newly prepared act erratic, that is their action is not normal. Quite frequently the anode does not reduce until the solution becomes aged. For aging purposes a small amount of aqua ammonia is added to the solution. We would suggest the addition of about ⅛ oz. per gallon.

The method of preparing silver solutions should be as follows:

1st. Water heated to about 140 deg. Fahr.
2nd. Sodium cyanide.
3rd. Silver cyanide.
4th. Balance of water cold.
5th. Ammonium chloride.

The voltage should not exceed one and a half, maximum.

In preparing an additional amount of silver solution, we would suggest that the formula be changed to read as outlined. Always take about one-third the total amount of water first, at 140 deg. Fahr., then proceed as outlined. Instead of sodium sulphate as a reducing agent, add ¼ oz. ammonium chloride, 98-100% (white granular), per gallon of solution. Other proportions as noted.

New silver solutions are often greatly improved by the addition of small amounts of carbon bisulphide, about 2 grains per gallon, previously dissolved in an ounce of the silver solution, with the addition of ¼ oz. sodium cyanide, and mixed thoroughly by agitation. We would suggest that you make such an addition to the gallon of solution you have prepared.

It is not necessary to copper plate brass before silver plating. The usual procedure is either to deposit a film of mercury or nickel plate for a few minutes, and "strike" the articles in a silver strike solution, for a moment or two at three or four volts, so that the nickel deposit is immediately coated. Otherwise, when plated afterwards in the regular silver solution, the silver deposit would be likely to peel from the nickel

Formula for Mercury Dip.

Water	1 gallon
Sodium Cyanide	6 ozs.
Bichloride of Mercury	¼ oz.

Formula for Silver Strike.

Water	1 gallon
Sodium Cyanide	6 ozs.
Silver Cyanide	¼ oz.

(Old steel files may be used as anodes.)

If the mercury dip is used a silver strike solution is not necessary.—C. H. P. Problem 2,812.

STATUARY BRONZE

Q.—We do some work in wrought commercial bronze, such as moldings, channels, and square tube, as used in bank counter screens. This we finish with emery to a natural color which in time will darken, as no lacquer is used. The objection to this is that the handling discolors the work. We would like to apply an acid or chemical that will give a finish similar to statuary bronze, and that can be applied on the job. Can you advise us what to use?

A.—If the bronze is coated with a very thin coating of beeswax, previously dissolved in turpentine with aid of heat, so that in cooling it is of the consistency of a thin paste, and applied with a brush or canton flannel, it makes no difference how much handling the bronze may have in erecting. No discoloration will result from handling. If you desire to produce a dark bronze finish, then procure some hydrosulphide of ammonia and mix in with the wax when melting, as outlined. The sulphide in the ammonia will act as an oxidizing agent.

The hydrosulphide of ammonia may also be applied with pumice stone and water and brushed down with hand-scouring brushes to an even bronze finish. It is possible that it could be mixed with emery and rubbed down as usual. However, wax would be necessary to protect the finish, so we would suggest that the plain wax coating be used or the wax mixed with the hydrosulphide of ammonia.

This material is also termed hydrosulphuret of ammonium.—C. H. P. Problem 2,813.

WHITE METAL CLEANING

Q.—Will you kindly advise me in some way to clean type metals, we are having trouble with it gumming up the small tubes, especially mixtures of 9 per cent tin, 19 per cent antimony, and 72 per cent lead, for Monotype machines. We are now using charcoal and salt as a cleaner, getting the metal to about 1,100 degrees and using a metal disturber to bring up the dirt. If you can suggest some books that would interest me in this line, also how to make solder out of scrap metal and make a clean wiping flow.

A.—The method of cleaning type metals most commonly used is by dosing or mixing them with sulphur, which brings all the dross to the top, and then with rosin, which removes the metal from the dross so that the skimmings contain almost nothing but dirt. A full explanation of these operations will be too long for us to give you here, but you can find the information you wish in the following articles:

The Manufacture of Soft Solder from Scrap. February, 1916.
Recovery of White Metals from Dross. March, 1916.

We have no extra copies of these issues, but you can probably find them in your local library.—A. B. Problem 2,814.

WIRING

Q.—I have made up a few home made tank switchboards of No. 26 gauge German silver wire, using 18 ft. of wire into 7 distributing contact points. Some are to be used for cutting down current to ½ volt, for small silver, acid copper, and black nickel work. Generator is 8 volt capacity. Do you think it will do that much work? If not how can I improve the switchboards, and is German silver wire the right wire.

A.—It is almost impossible to give any satisfactory answer to the inquiry which you have sent here, because you do not say anything about the number of amperes which you wish to use.

The arrangement which you mention, of using No. 26 gauge German silver wire, in 18 ft. lengths, may be all right if you were to use only 1 or 2 amperes from the generator. Wire of this size would be entirely too small to use to carry large volumes of current.

The No. 26 wire may be all right, as said before, for about 2 amperes and German silver wire is one of the best resistance mediums that is used for switchboard use, but where a larger number of amperes is required, it is the custom to use iron wire instead of German silver wire for cutting down the current.

Our idea is that if you will write to one of the platers' supply houses advertised in THE METAL INDUSTRY and advise them of the maximum voltage and the minimum voltage, and the maximum and minimum amperes, they will be able to suggest a rheostat which would be the best suited for their particular kind of work.—C. G. B. Problem 2,815.

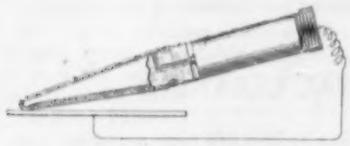
PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,318,709. October 14, 1919. **Ignitible Metallic Mixture and Process for Preparing the Same.** Claude Theodore James Voutin, of London, England, assignor to Thermalloy, Ltd., of London, England.

This invention relates to ignitible metallic mixtures, such for example as that commonly known wherein powdered aluminium and powdered iron oxide are intimately mixed together with the result that, if a sufficiently high temperature be created locally in the powder, combustion will proceed of itself under the oxidation of the aluminum and the reduction of the iron.

1,319,192. October 21, 1919. **Means for Electroplating Metals and the Like.** Ferdinand von Madaler, of Good Ground, and John W. Von Der Lieth, of Brooklyn, New York, assignors of one-third to Harry I. Bernhard, of Brooklyn, New York.

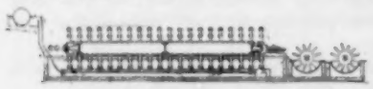


This invention is a device for effecting the rapid electro deposition of metals in the art of electro-plating the surface of one metal (or other substance) with another metal, such as nickel, copper, silver, etc.

The object of the invention is to apply easily and rapidly a metallic coating to the surface of a metal part or object, thereby eliminating the delay and expense which ordinarily is involved in the operation of electro-plating.

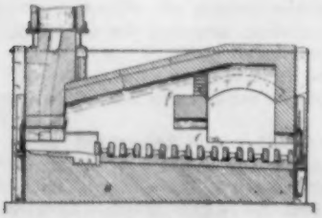
1,319,029. October 14, 1919. **Apparatus for Electro-plating.** Gerhard T. Potthoff and Kurt T. Potthoff, of Brooklyn, New York.

This invention relates to electro-plating apparatus for commercial use on a large scale and the object is to provide means to permit the ready electro-plating of a number of articles simultaneously, whereby said articles may be readily immersed in and removed from the electrolyte or bath, and our invention has particular reference to galvanizing, by the electrodeposit of zinc, a plurality of pipes simultaneously, as for conduits to contain electric conductors; a further object is to improve the quality of the manufactured product, to provide greater durability and uniformity of plating, and to accomplish the purposes more economically than heretofore.



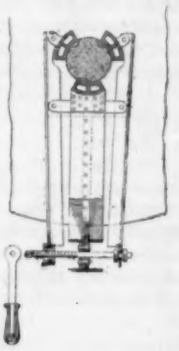
1,318,948. October 14, 1919. **Sheet and Tin Mill Furnace.** Thomas V. Allis, of Pittsburgh, Pa.; Hannora E. Allis, administratrix of said Thomas V. Allis, deceased.

In the art of manufacturing sheets and tin plate the metal bars are rolled down in pairs in a heated state, to sheets of the desired gage. It is customary to reheat and double the metal one or more times intermediate the bar and finished stage. The heating of the bars and the intermediate reheating is effected in separate furnaces as the temperature of the bar or "pair" furnace is not suitable for the intermediate reheating.



These improvements consist in a superior arrangement of a continuous "pair" heating furnace, a "sheet" or intermediate reheating furnace, and independent fire boxes for each furnace, all contained in a unitary structure, whereby valuable floor space is economized, and the operation of the various parts aforesaid is facilitated.

1,318,992. October 14, 1919. **Electrode Holder.** Julius R. Hall, of Oak Park, Illinois, assignor to Booth-Call Co., of Chicago, Illinois, a corporation of Illinois.

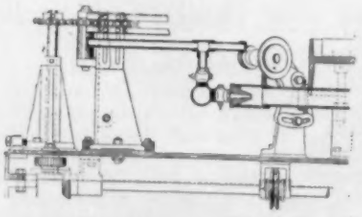


This invention relates particularly to ectrode-holders for use in connection with electric furnaces.

The primary object of the invention is to provide an electrode-holder for furnaces which will securely grip and support the electrode, which will provide good electrical contact between the electrode and the grippers, and which will afford a staunch and reliable construction with proper provision for a reliable electric circuit.

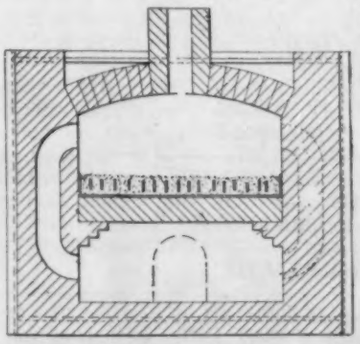
While not limited thereto, the invention is especially desirable in electrode-holders of that type in which the electrode is adjustable from the side of the furnace.

1,318,871. October 14, 1919. **Machine for Soldering Seams of Can-Bodies.** John Heine, Jr., of Leichhardt, near Sydney, New South Wales, Australia.



This invention is based on the principle of raising molten solder by capillary action from the solder bath to the seam, the solder being applied only in the requisite quantity to close the seam, and is sweated simultaneously with its application to the seam, and dry excess is finally wiped off. This method enables the seam soldering or sweating operation to be carried on with a continuous as contradistinguished from an intermittent movement of the can bodies through the soldering machine and in the case of side seams without imposing any rotational tendency on the can bodies by which the side seam would be removed from alinement with the soldering and sweating tools.

1,318,367. October 14, 1919. **Process of Tempering Metals.** Thomas J. Fay, of Brooklyn, New York, assignor by mesne assignments, to the Standard Parts Company, of Cleveland, Ohio, a corporation of Ohio.



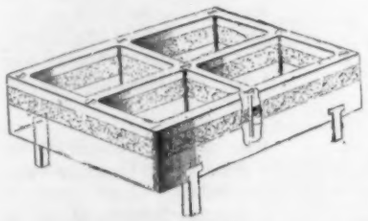
This invention relates to the tempering of metals and more particularly to a process and apparatus whereby the articles to be tempered are maintained at a uniform temperature throughout their length and without liability to burn. In carrying out this invention a bath of granular refractory material (preferably quartz sand) is used, which, by the apparatus employed, is maintained at a uniform temperature throughout its entire extent and which temperature is sufficient to heat the articles to a sufficient degree to enable them to be tempered by subsequntly subjecting them to a quenching bath in the usual manner.

1,318,748. October 14, 1919. **Manufacture of Metal Rolls.** Sir Robert Abbott Hadfield, Westminster, England.

This invention has reference to improvements in the manufacture of rolls of the kind referred to designed to overcome the difficulty referred to.

For this purpose, a roll according thereto is made of high quality steel such as nickel-chromium steel, or chromium steel, or nickel steel, forged or cast approximately to shape, then annealed and machined to the required finished shape, after which it is heat treated in such a manner, as by heating it to a hardening temperature and quenching it in a suitable cooling liquid, that the enlarged or working portion of the roll is rendered hard, tough and durable.

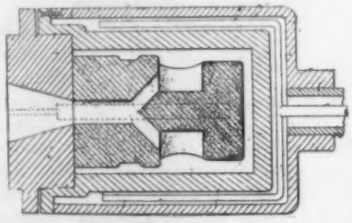
1,320,705. November 4, 1919. **Molding Apparatus.** Albert A. Pauly, of Cleveland, Ohio.



One of the objects of the invention is to provide an improved form of apparatus for the purpose specified whereby the articles may be produced in the most expeditious manner and at a minimum cost. A further object of the invention is to provide a molding machine with suitable means for lubricating the mold surfaces and so that the articles will have a smooth surface and may be ejected from the molds without difficulty.

1,320,910. November 4, 1919. **Molding Machine.** William John Perry, of Toronto, Ontario, Canada.

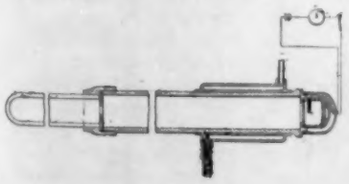
The principal objects of this invention are, to reduce the cost of production of cast metal articles and to enhance their quality, producing a more uniform texture of material free from blow holes and unequal porosity.



A further and important object is to devise a machine which will be an active agent in the increase of quantity production and which may be adjusted to suit varying conditions of material and the shape of article being made.

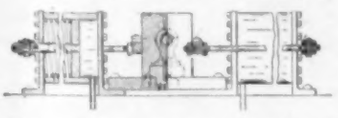
The principal feature of the invention consists in the novel construction of the device, whereby the molds are rotated about their own axes and are coincidently revolved radially as the metal is poured.

1,318,516. October 14, 1919. **Radiation-Pyrometer.** Cyril T. Wallis and Ralph C. Schwarz of Rochester, N. Y., assignors to Taylor Instrument Companies of Rochester, N. Y., a corporation of New York.



This invention relates to radiation pyrometers for determining temperatures, particularly that type in which the heat sensitive element, such as the hot junction of a thermocouple or an element whose resistance or characteristics are changed when subjected to the radiant heat, said element being contained in or controlling an electric circuit operating a suitable measuring instrument. The objects of the invention are not only to protect the heat sensitive element so that the instrument will accurately indicate slight changes in temperature, but also to provide an instrument preferably of the fixed focus type, and to obtain the "black body" condition and insure the correct indication of temperatures by eliminating gases or vapors which might prevent a correct indication.

1,318,380. October 14, 1919. **Casting Apparatus.** Clarence W. Hazelett, of Lakewood, Ohio, assignor by mesne assignments to National Carbon Co., Inc., a corporation of New York.

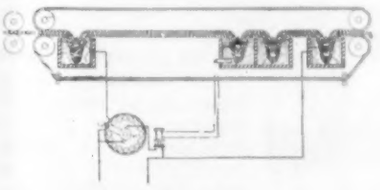


This invention relates to apparatus for casting storage battery parts. While the invention is described and illustrated as applied to making a certain type of lead casting, it will be evident to one skilled in the art that by suitable variations the apparatus may be adapted for making other forms of castings either from lead or other materials.

The object of this invention is to eliminate the previously mentioned disadvantages and to facilitate molding of such parts.

1,319,085. October 21, 1919. **Treating Metals.** Allan F. Jacobson, of New York, N. Y.

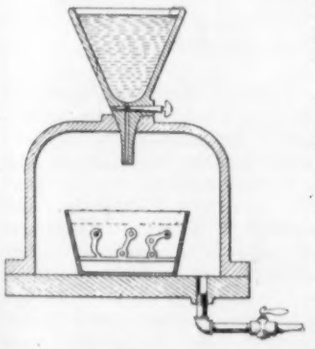
The object is to provide a means for annealing and cleaning metals during actual process of rolling, or directly thereafter, and without the necessity of removing the metal from the rolling mill, or of coiling it, or otherwise preparing it for annealing.



As another object, the invention contemplates the provision of a means for automatically regulating the temperature to which the strip is heated and maintaining the strip heated during the cleaning process.

A still further object of the invention resides in the provision of a means for regulating the temperature of the strip by the temperature of the cleaning liquid.

1,320,770. November 4, 1919. **Process for Making Molds for Castings.** Victor Lougheed, of San Francisco, California, assignor to Enterprise Foundry Company, of San Francisco, California, a corporation of California.



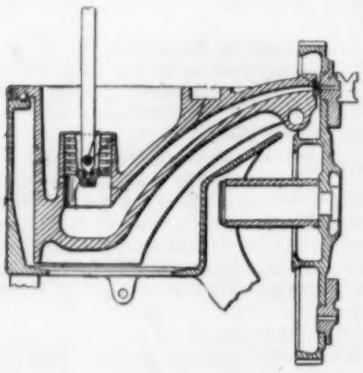
The object of this invention is to provide a simple, reliable and thoroughly practical method for quickly, completely and properly coating with a fluid, semi-fluid, or plastic mold material the interior and exterior surfaces of the most complex and intricate pattern. It attains this object, and thus economically and unfailingly obviates the usual difficulties with air bubbles, by placing upon a suitable mounting one or more patterns in an air-tight vessel, from which the air is subsequently exhausted so as to produce a vacuum, during the maintenance of which the mold material is allowed to flow into the vessel.

1,318,702. October 14, 1919. **Method of Manufacturing Aluminum Alloys.** Arrigo Tedesco, of Turin, Italy.

This invention relates to a method by means of which the association of aluminum with the other metals intended to enter into the final alloy, such as zinc, copper, titanium and vanadium, is obtained in the best possible conditions, and particularly with a view to obtaining a properly homogeneous alloy.

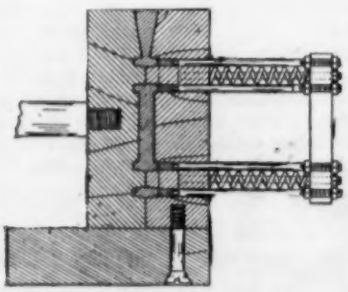
The method according to this invention consists in preparing separately a bath of basis alloy containing a portion of from 10 per cent to 20 per cent of the total weight of the final alloy, said bath containing light metals to an amount of from ½ to ⅔ by weight relatively to the heavy metals.

1,318,877. October 14, 1919. **Type-slug-casting Mechanism.** Thomas W. Johns, of Floral Park, New York.



The primary object of this invention is to provide novel and improved means whereby drawing of the type metal from the slug back into the throat of the metal pot is avoided, with the result that the slug will contain the full amount of metal and will be solid, the means provided by the present invention for accomplishing this result being relatively simple and inexpensive in its construction and positive and certain in its action, and, furthermore, it is readily applicable to metal pots or crucibles such as those commonly used upon slug or type-casting machines.

1,318,404. October 14, 1919. **Casting Apparatus.** Thomas C. Penn, of Cleveland, Ohio, assignor to National Carbon Company, Inc., a corporation of New York.

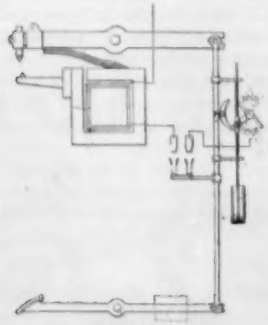


This invention relates to an improvement in apparatus for metal casting and is more particularly adapted for casting lead storage battery parts. In casting these lead parts iron molds are used which cool and solidify the lead immediately, so that the articles are ready to be removed at once, although they are still too hot to handle and stick rather firmly in one of the sides of the mold. On account of this it is necessary to pry them out by means of a pointed rod, and in so doing the castings sometimes are bent if they happen to stick in the mold very tightly.

The object of the present invention is to provide for the ready removal of the articles from the mold.

1,318,563. October 14, 1919. **Electric Welding Apparatus.** William Herbert Isherwood, of Far Headingley, Leeds, and William Herbert Turner, of Leeds, England.

This invention relates to improvement in hand or foot operated apparatus for electric contact welding, especially for the operation known as "spot welding." Hitherto in this kind of apparatus the current is supplied to the primary winding of the welding transformer through a hand or foot-operated switch controlled by the operator, and especially in the case of thin plates or strips, considerable skill and judgment is necessary to produce a satisfactory weld while avoiding injurious excess of current.



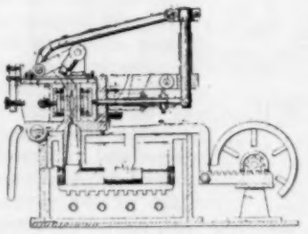
This invention comprises mechanism whereby the period during which current is supplied is pre-determined, adjustable for various kinds of work, and independent of the operator.

1,319,508. October 21, 1919. **Process for Protecting Copper and Its Alloys from Attack by Atmospheres or Liquids.** Guy Dunstan Bengough and Oswald Freeman Hudson, of London, England, assignors to themselves, to the Imperial Trust for the Encouragement of Scientific and Industrial Research and to the Institute of Metals, both of Westminster, England.

By the present invention, copper or its alloys, more partincularly copper-zinc alloys, may be protected from atmospheric influence or attack by water or saline solutions by heating the metal under such conditions that there is formed on its surface an adherent layer of oxid, which may be subsequently or immediately converted wholly or partially into an oxy-salt by natural or artificial agency. This oxy-salt varies in composition with the nature of the metal surface and the mode adopted in producing it, but it is mainly a mixture of a basic chlorid and a basic carbonate.

1,318,558. October 14, 1919. **Casting Machine.** Max O. Held, of North Milwaukee, Wis.

This invention relates to casting machines particularly adapted for casting small metal objects such as lead soldiers and the like, though the principles involved may apply to other molding machines.



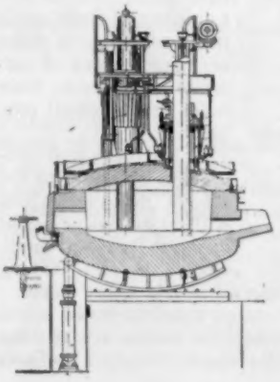
An object of the invention is to permit of the work being quickly performed.

Another object of the invention is to permit details of construction of a machine of this character.

With the above and other objects in view the invention consists in the casting machine as herein claimed and all equivalents.

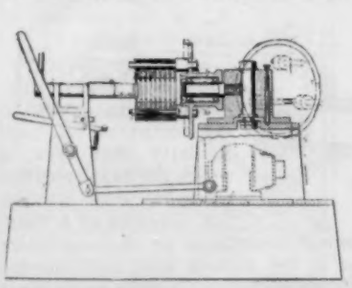
1,320,884. November 4, 1919. **Electric Furnace.** Carlo Masera, of Turin, Italy.

This invention has for its object some new and useful improvements in the electric furnaces for melting and refining steel and metallic alloys, by which the efficiency and duration of the furnace are increased and a cooling of the electrodes is effected while at the same time said electrodes are protected from the outside air as well as from the circulation around them of the gases produced in the furnace whereby they are not subject to wearing out. Also the metal is protected from the oxidizing effects of air.



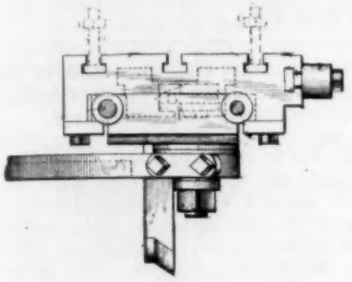
1,320,744. November 4, 1919. **Centrifugal Casting.** Dimitri Sensaud de Lavaud, of New York, N. Y.

This invention relates to improvements in centrifugal castings, and more particularly aims to provide improvements in rapid-production processes and machines for casting annular members, as piston-rings, in groups.



The present invention has for its main object to provide a novel multiple-casting mold for casting the articles in groups and adapted to be readily taken apart after a casting operation to remove the castings and to be thereafter readily reassembled in readiness for a second casting operation.

1,320,752. November 4, 1919. **Wheel-Dressing Means for Grinding-Machines.** Edward B. Gardner of Beloit, Wis., assignor to Badger Tool Company, of Beloit, Wis., a corporation of Wisconsin.

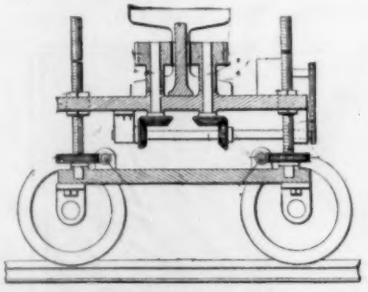


This invention relates to the art of grinding machines, and the general object of the invention is to provide an improved work table and means thereon for dressing the grinding wheel.

A special object is to provide a wheel dressing device which is small and compact, and to provide means for mounting the device on the work table in such a way that the device may remain on the work table at all times ready for use, and yet will not interfere with the attaching of the work to the grinding table or with the grinding operation.

1,320,707. November 4, 1919. **Molding Apparatus.** Albert A. Pauly, of Cleveland, Ohio.

This invention relates to apparatus for molding cementitious and analogous materials and particularly to apparatus for making reinforced concrete beams.

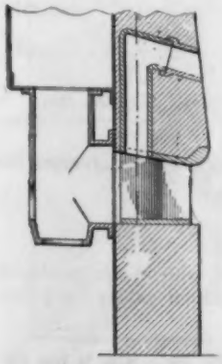


The principal object of the invention is to provide an apparatus for the purpose above described whereby the molded articles may be produced in the most expeditious manner and at a minimum cost.

In making articles of concrete or analogous materials, one of the principal items of expense is in connection with the labor for making and handling the articles, and in accordance with the present invention comparatively simple and inexpensive apparatus has been provided for rapidly molding the articles and conveniently and safely handling them, while green, at a minimum cost.

1,320,158. October 28, 1919. **Cupola Variable Twyer.** Andrew H. McDougall, of Harvey, Ill., assignor to Whiting Foundry Equipment Company, of Harvey, Ill., a corporation of Illinois.

This invention relates to twyers for cupola furnaces. The object of the invention is to provide a twyer construction for such a furnace in which the side walls of the twyer can be shifted at the will of the operator to vary the size of the twyer opening and thus soften or strengthen the character of the current of air passing through the twyer as the material melting or other conditions may require. The invention consists in means for carrying out the foregoing objects, which can be easily and cheaply made, which is satisfactory in operation and is not readily liable to get out of order. More particularly, the invention consists in the features and details of construction hereafter more fully set forth in the specifications and claims.

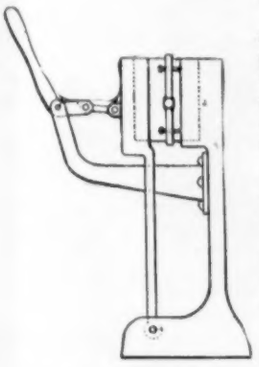


1,319,537. October 21, 1919. **Molybdenum Bronze.** Seiko Shigeta, of Tokio, Japan.

This invention relates to a molybdenum bronze consisting of an alloy of copper, aluminum, molybdenum and tungsten.

The object of this invention is the production of a new practical alloy which has properties similar to gold as to color, brilliancy, immutability and ductility, etc.

1,318,379. October 14, 1919. **Casting Apparatus.** Clarence W. Hazelett, of Lakewood, Ohio, assignor by mesne assignments to National Carbon Company, Inc., a corporation of New York.

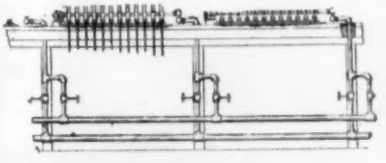


The invention relates to casting and more particularly to an improved manner of removing molded articles from the molds. Although the invention is shown and described as it would be applied to apparatus for casting lead storage battery parts, it is not to be understood that the invention is limited thereto.

The object of the invention is to permit simultaneous casting of a plurality of articles and to facilitate the removal of the castings from the mold. In the broad aspect it consists in slicing off, as it were, a thin slab from the mold, half of which has the greater tendency to retain the casting, whereby an ejector plate is formed to withdraw the casting therefrom.

1,320,632. November 4, 1919. **Apparatus for Soldering.** George B. Metcalf, of Oak Park, Ill.

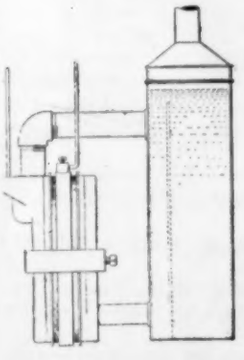
This invention relates to apparatus for soldering and the principal objects of this improvement are:



First, the provision of apparatus constructed largely of gas fittings, simple and practical in operation, and capable of indefinite duplication of working sections and the consequent turning out of large quantities of work in a given time without the employment of skilled labor;

Second, the production of devices of the class described whereby maximum heat and improved results with minimum consumption of fluid fuel may be obtained.

1,319,715. October 28, 1919. **Electrolytic Apparatus.** Ernest Arthur Le Sueur, of Ottawa, Ont., Canada, assignor to the Diamond Match Company, of Chicago, Ill., a corporation of Illinois.



This invention relates to that class of electrolytic apparatuses whereby chlorates and the like are obtained from the chlorids of alkali and alkaline-earth metals, having reference more especially to the type of apparatus wherein the electrolyte is caused to flow directly between and in contact with spaced electrodes. In this type of apparatus the anode is composed of platinum (or similar metal) on account of its chlorin resisting property; and hence, in view of the relatively high cost of the metal, attempts have heretofore been made to provide a structure wherein the maximum electrolyzation with a minimum quantity of the precious metal may be attained.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

BILLET PIERCING MACHINE—MANNESMAN PROCESS

This machine will make brass and copper tubes, from 2 in. to 3½ in. diameter round cast billets, by the Mannesman billet piercing process. These tubes vary from 2⅛ in. diameter by 5/32 in. thick to 4 in. diameter by 5/16 in. thick, depending upon size of billets used, also side of mandrel. Billets up to 54 in. long can be used and the resulting tubes will range from 10 to 14 ft. in length. The machine at 200 r.p.m. is rated at fifty 2½ in. billets per hour, weight 3,000 lbs. and an equal weight of larger billets.

For this range of sizes a motor of 200 h. p. at 450 r.p.m. is required. If 3 in. billets is the maximum size desired a 150 h. p. motor can be used.

The machine consists of three units. Pinion housing, roll housing and tail stock, with proper connecting links between. The pinion housing consists of a one-piece box casting, containing six bearings, one on each end of the actual driving pinion, and the other on the two gear spindles, which are located diametrically opposite the pinion. A one-piece cover is bolted and dowelled to this casting so that all gearing is enclosed in an oil tight box and should be run in oil. All bearings are of bronze and easily removable for replacement in case of wear.

It is claimed, however, that wear will be very slight because of the ruggedness of design and splash lubricating.

The pinion and gears are cut steel, the pinion being cut integral with its drive shaft, which extends through an end to receive one-half of a flexible coupling. The other half of the coupling is mounted on the motor shaft. There is therefore only one gear reduction between the motor and driving roll.

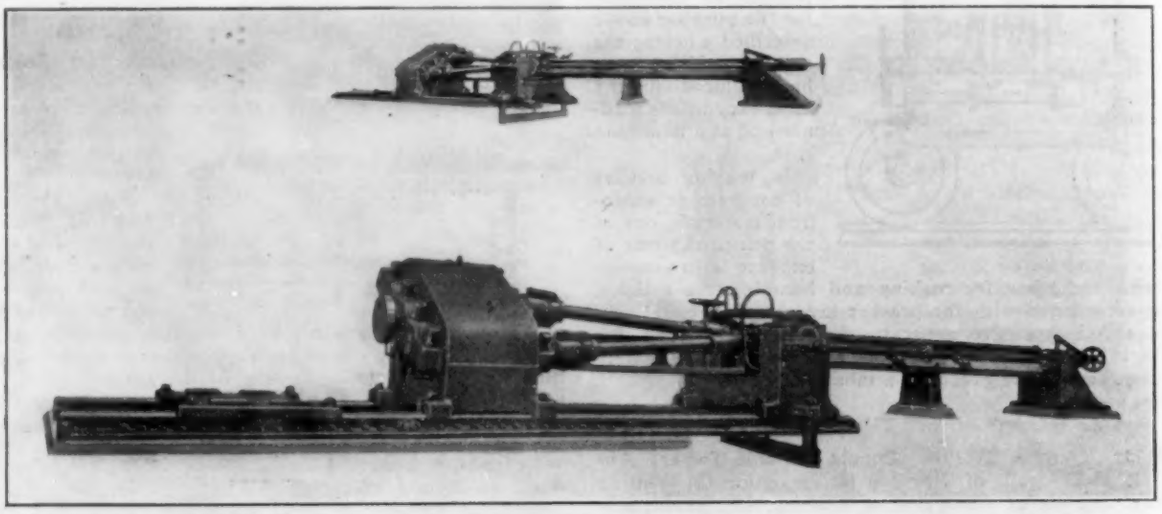
A pair of shoeplates are furnished on which the motor, pinion stand and roll stand are mounted in rigid alignment.

The two main rolls are mounted in a heavy roll stand and driven through forged steel spindles with universal joints on both ends, which connect with the gear spindles. They are adjusted by screw and nut and a clamping device is included which holds them rigidly in place during the operation. The bottom guide roll is adjusted by a hand wheel. The machine is regularly furnished with proper guides for one size billet. This is of simple construction and can easily be replaced by other size guides as required. The guides are adjustable for all size billets within the limit of the machine.

Each size billet requires a piercing mandrel and guide rings, one size of which is regularly furnished. This guide has a quick release device so that the rolled tubes can be rapidly removed. The tail stock is quick acting and swings out of the way to allow removal of mandrel. It contains a ball bearing thrust.

The tube guide is of the idle roller type, which prevents any scratching of the tubes being rolled, and is said to be the most satisfactory kind of brass and copper.

This machine is manufactured by the Philadelphia Roll & Machine Company, Philadelphia, Pa.



BILLET PIERCING MACHINE

HINTS ON FORMING ZINC

SOME SUGGESTIONS FROM THE NEW JERSEY ZINC COMPANY ON FORMING ROLLED ZINC THAT WILL AID THE METAL WORKERS

1. The depth of the first cup should not be more than 45% to 50% of its diameter. Subsequent steps may be about the same as in brass.
2. The best results will be obtained by starting with a blank of approximately the same gauge as the desired ultimate wall thickness.
3. Use as little tension as possible on the pressure pad, only enough to keep the blank from wrinkling.
4. Give the dies as much radius as possible. This will reduce breakage to a minimum and will also reduce wear on the tools.
5. Annealing and pickling operations are unnecessary and, in fact, harmful to zinc.
6. Soap appears to be the most satisfactory lubricant.
7. In extremely cold weather it is advisable to warm the zinc slightly, preferably in a bath of water heated to not more than 125° Fahrenheit.

THE USES OF MAGNESIUM

SHAWINIGAN ELECTRO-METALS COMPANY, CHICAGO, ILL.

LEAD

*1.—As a hardener and strengthener, used in percentages less than 5%, usually less than 1%.
  *a.—Bearing metals.
  b.—Die castings.
  c.—Casting metal.
2.—Alloy 15% to 85% to be treated with steam producing hydrogen gas and lead and magnesium oxides for paints, etc.

STEEL

1.—Deoxidizing agent, in the pure state its action is too violent for safety.

*Indicates present commercial use.

ZINC

1.—Alloy, it produces finer grain in zinc castings and increases hardness and strength.

MAGNESIUM AS A COMMERCIAL METAL

1.—Moving parts in instruments where lightness will be a factor in increasing the delicacy or accuracy of the instrument.
2.—Reciprocating parts in gas engines or other machines where lightness, strength and heat conductivity are important factors.
3.—Parts of machines which require strength and lightness.

PROBABLE RESULTS OF MAGNESIUM AS A DEOXIDIZING AGENT

a.—Reduction of oxides and dissolved gases.
b.—Increased density.
c.—Increased resistance to acids and alkalis (corrosion).
d.—More fluid metal.
e.—Increased strength.
f.—Decreased metal loss.

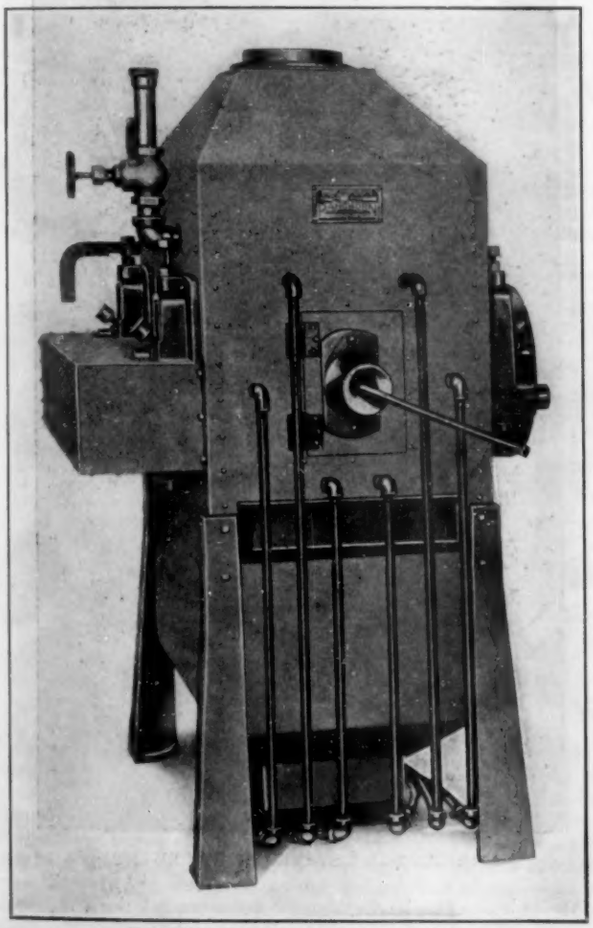
ROD CLEANING SAND-BLAST CABINET

A new cabinet for the sand-blasting of various shaped rods, from 3/8" to 7/8" diameter, just produced by the Pangborn Corporation, Hagerstown, Md., embodies some novel features of continuous operation, with hygienic construction for protection of the operator.

The blasting operation being entirely confined, the cabinet can be readily installed with other machine tools; this feature also removes the operator from all contact with the dust-laden air.

A set of rolls and guides at either end of the cabinet provide constant, uniform travel of the rods through the blasting zone. The feed rolls are shaped to handle all diameters from 3/8" to 7/8" and of varying shapes.

By six blast projectors, centering to the rod at a 45° angle,



PANGBORN SAND BLAST CABINET

the blast stream covers the entire surface of the rod, the discharge being directed toward or into a small chamber that utilizes the rebound effectiveness of the abrasive.

Scale is said to have been removed from 3/4" diameter rod, with 80 pounds' air pressure at 50 lineal feet per minute.

The bottom of the cabinet forms a hopper for abrasive storage. The blast action is of the suction type, and individual feed boxes in plain sight of the operator feed each blast projector. Connection to an exhaust system removes disintegrated material.

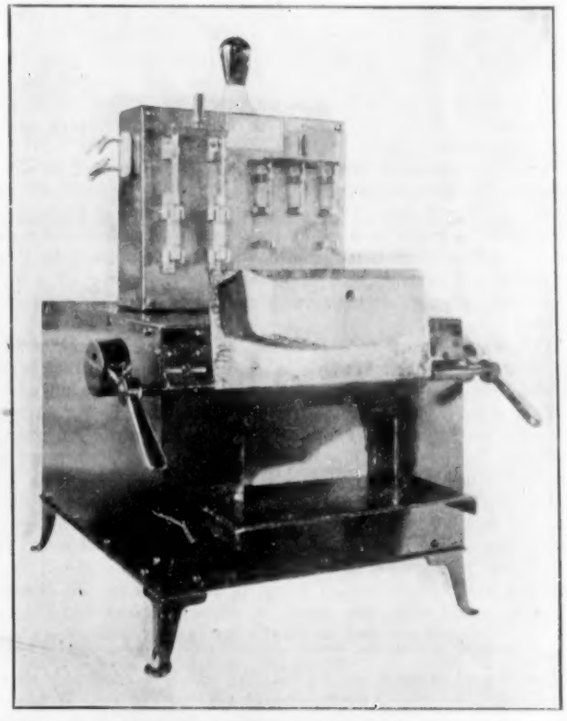
The cabinet is adaptable for use with either sand or the metal abrasive and occupies a floor space of but 45" x 51" and is 69" high.

ELECTRIC MUFFLE FURNACE

The General Electric Company has developed an electric furnace of the muffle type, which is designed to meet the demand for a durable, economical and convenient furnace for temperatures up to 850 degrees C., for baking vitreous enamel, hardening and tempering tools, dies, etc.

The device consists of the furnace proper, with a control panel mounted on top at the front. The furnace is very strongly built, but small enough to be placed anywhere that will prove convenient. The heating element, which is mounted on the outside of the muffle, and covered with compound, is so placed as to give a very even distribution of heat throughout the inside. The element is divided so that it is possible to get two degrees of heat, for convenience called low and high heat. The former is used to give a high initial heat so that the maximum temperature can be reached quickly, in an hour and three quarters to be exact—and the latter is sufficient to maintain this temperature. The muffle is mounted on a strong steel casing, and the walls, door, etc., are thoroughly insulated, thus preventing loss of heat from radiation.

The control panel, which carries the necessary apparatus for controlling the furnace, is equipped with a main line switch, a double throw switch for high or low heat, and a red pilot lamp



ELECTRIC MUFFLE FURNACE

which acts as a warning to the operator when the furnace is on high heat. There are connections at the side of the panel for connecting rheostats when temperatures as low as 300 C. are desired. By this arrangement a very good control of the temperature is assured, and, due to the pilot lamp, there is very little excuse for the destruction of material due to carelessness, or inability on the part of the operator to tell what heat is on.

The furnace is further provided with a shelf in front for the convenience of the operator, and the door is equipped with

counter weights to keep it open. The high heat necessitates 4 K.W. to bring it up to 850, and the ordinary running temperature only takes 1.8 K.W.

The advantages of such a furnace for laboratory or shop use are manifold. The fumes, noise and smoke that accompany the usual furnace are absent, and so is the necessity for a number of pipes to carry gas to the furnace. The fire risk of the furnace is practically non-existent. It is said to be perfectly safe to go away and leave it absolutely alone for any length of time, on low heat, and the pilot lamp serves as a warning so that the high heat will not be left on. It does not occupy a great deal of space, and can be set in the most convenient place for operation, without disturbing any of the rest of the installation. The General Electric Company claims that it is very economical, efficient and adaptable to numerous applications, such as heat carbon steel in tool making, baking patterns on china, and laboratory work of all sorts.

WATER JAPAN*

Baking japan as ordinarily used in manufacturing consists of two elements, the base and the solvent. The base is usually some variety of asphalt, combined with linseed, or some similar oil, the whole making a hard rubbery appearing substance. This must be liquified for use, and the common practice is to dissolve it in naptha, or kerosene. The process of japanning various metal articles consists in dipping them in the liquid japan, and then baking them in an oven.

Owing to the volatile and inflammable type of the solvents used, this baking process is somewhat hazardous. After several bakings have been consummated the atmosphere in the oven resembled that of the inside of a gasoline engine cylinder, only needing a spark, or even excessively high temperature to cause an explosion of great force. Occasionally the results of these ovens blowing up have been disastrous, due to losses from fires, caused by the explosion.

This risk has been great enough to cause some of our large municipalities to consider requiring a manufacturer to not only isolate his oven building, but to provide further protection in the form of a fire wall. It also seemed possible that the insurance companies might become interested to the extent of causing increased expenditures on the part of manufacturers who are large users of japan.

The manufacturers consequently became interested in the possibility of developing a type of japan which has a non-combustible solvent. The Research Laboratory of the General Electric Company was requested to try and evolve such a product and a course of research on their part resulted in the development by them of a variety of japan which eliminated the necessity of a solvent possessed of the destructive propensities of the conventional kinds.

This water japan, as it is called, is an emulsion of the asphalt oil base with water. By this is meant that infinitesimal particles of the base are held in suspension in the water, instead of being dissolved in it. It was found that this japan had no tendency to settle out, even after months of storage, and that, owing to its being "suspended" in water, losses by evaporation were practically negligible.

The methods of applying the japan are two in number, the electric dip, and the hot dip. The former is appropriate for small articles and consists in placing them, charged positively in a negatively charged iron tank of japan. The result is that an even, smooth coating of japan is deposited on the articles in question, and, since the japan is deposited free from solvent, there is no resultant drip when the lot is conveyed to the baking ovens.

The second method, or the hot dip, which is applicable to large pieces of metal, was found more or less by chance. It had been the custom in the laboratory to preheat the metal before dipping, in order to free it from dirt and grease. This preheating evidently had the same effect of causing the japan to form a deposit on the metal as giving it a positive electrical charge. A third method is also sometimes used which is a combination of the two already mentioned. That is to say, the metal is both heated and positively charged.

The result has been that a variety of japan has been evolved that is said to give exactly the same effects as the solvent variety. It should be cleaner to handle, owing to the absence of drip, and eliminate the danger from explosions and disastrous fires that were such an unpleasant feature of the old form of this highly necessary compound.

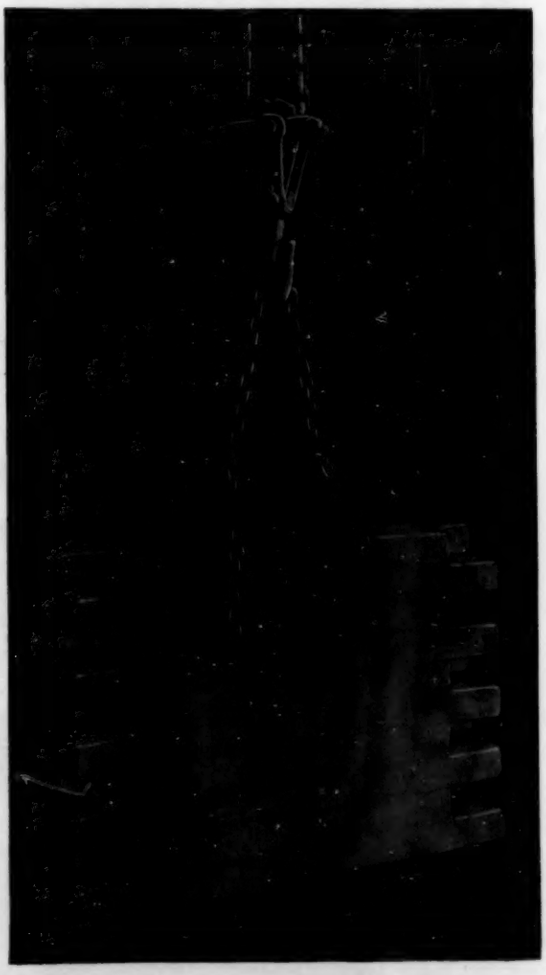
*See article on Water Japan by Wheeler P. Davey in THE METAL INDUSTRY, December 1919, p. 509.

NEW OXIDIZER

Liquid sulphur, liquid preparation for oxidizing copper and zinc, has been placed on the market by the Sulphur Products Company, Greensburg, Pa. It is a highly concentrated sulphur compound, used in the proportions of one-quarter ounce to the gallon of water. The manufacturers claim that it keeps indefinitely, that it is fool proof, that it produces an even color and that the deposit of oxide can easily be relieved. They guarantee liquid sulphur unconditionally and ship on approval.

STRENGTH OF FIRE BRICK CEMENT

For the purpose of demonstrating the "air-set" feature of their high temperature cement, the Quigley Furnace Specialties Co., of New York, has laid up a 9-inch section of wall containing 70 standard fire brick, as shown in the adjoining illustration. In laying up the wall the bricks were first dipped in water and then the ends and one side dipped in a batter of Hytempite. Bricks were squeezed together and taped to insure a close fit and a strong, thin joint secured.



TESTING THE STRENGTH OF CEMENT

A reasonable time was allowed for the "sample wall" to set at atmospheric temperature, no heat being used to effect the bond. Holes were then drilled through the wall between the third and fourth courses from the top and bolts run through. To these bolts, chain tackle for hoisting the wall section was attached.

The mechanical strength of the air-set joint was demonstrated

by shipping the walls section from New York to Philadelphia for exhibition purposes where it was suspended for inspection in the Quigley Company's booth at the convention of the American Foundrymen's Association, and later reshipped by motor truck to New York and other points. It still remain intact.

Walls and arches of furnaces or boiler settings are often subject to similar, though less severe, mechanical strain on account of vibration due to adjacent machinery, or other conditions which tend to open the joint; resulting in cracks, a broken arch or bulging wall and the ultimate collapse of the furnace structure. Thus the need of a shock-proof as well as heat-proof joint can be fully realized.

While this test illustrated the fact that a bond is secured at normal atmospheric temperature through the entire thickness of both courses, it is claimed that the action of heat will merely strengthen the bond which will retain its strength up to the fusing point of the brick itself.

The weight of the section shown is approximately 525 pounds, of which 25 pounds represents the quantity of cement used.

AN ECONOMICAL TUBE ROLLING MILL

A seamless tube, made of non-ferrous metals and alloys, having an even wall thickness, smooth surface, and no crystallized structure, it is claimed can be procured in the following manner.

When employing a three-roller system, driving two larger side rollers, the third one not being driven, several important resultants may be observed.

A regular taper must form on the billet when between the three rollers, which serves to give the material the greatest permissible speed at proper revolution of the rollers.

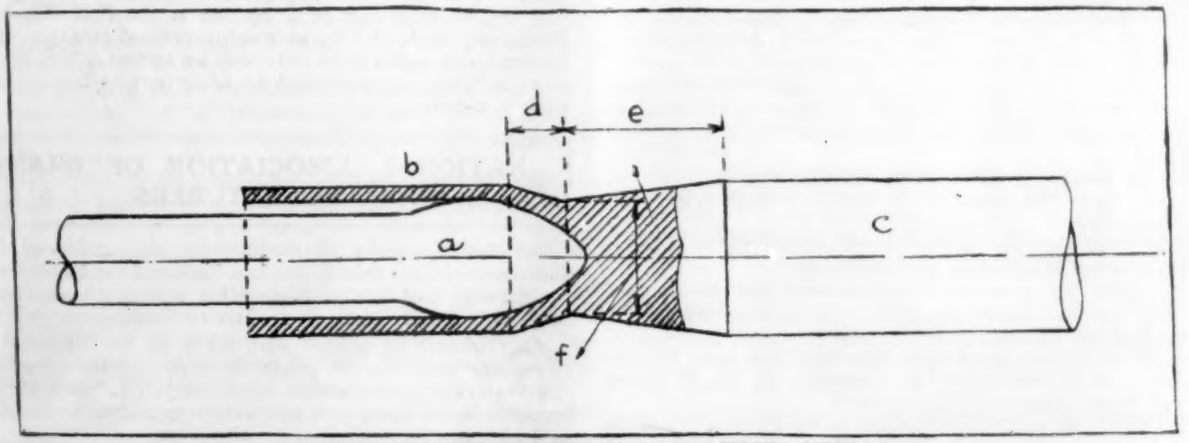
The speed of the Wolffgram Rolling Mill, when forming the rolling tube, is "two seconds per foot."

Upon first reflection it is generally assumed that this can be accomplished by installing rolling mill with higher revolution; this, however, is not the case. The most important thing is to give the rollers the correct form, so that the taper (see sketch) which affords the material required speed, may be properly shaped. It is, however, decidedly wrong, to give the side rollers the same form.

The aforegoing has been illustrated and described in Patent 1185270, under date of May 13, 1916.

In order to eliminate the necessity, in connection with billets of varying diameters, to have the rolling mill run slower and then again faster, The Wolffgram Mill has been provided with an equipment, whereby the rollers may be brought under any desired angles to one another. Thus it is possible, without changing the speed of the rolling mill, by the formation on the billet of a shorter or longer taper, to give the material a greater, or respectively a lesser speed, so that a time limit of two seconds may be obtained in connection with almost all rolling tubes. This has been described in Patent No. 1234245, July 24, 1917.

The mill is said to have shown that, when employing a speed of two seconds per foot, with which speed the rolling tube is being developed out of a solid billet in warm condition, the grain of the rolling tube material is the very best. Details can be obtained from Ludwig Wolffgram, consulting engineer, 815 W. 10th street, Erie, Pa.



SKETCH SHOWING WOLFFGRAM TUBE ROLLING METHOD

STORING COAL WITH SCOOP CONVEYORS

An interesting application of scoop conveyors for storing coal is that of five machines being used to unload coal from hopper bottom cars direct to storage pile. Four of these machines are 12" wide x 24' long, the other one being 12" x 20'. Each is equipped with its own electric motor and can be operated singly, if desired.

These machines provide a convenient, efficient and flexible arrangement. The first machine is practically self-feeding from the hopper doors of the car and the other four may be swung around at any angle to cover a wide storage area. Five machines arranged in this manner can be operated by one or two men. They can also be used to convey the coal direct from storage pile into boiler room. Where desired, one machine can be used to load an electric storage battery truck to convey the coal directly into the boiler room, as shown in Fig. 1.

FIG. 1. CONVEYOR LOADING COAL

The advantages of using several 20' or 24' long conveyors are quite obvious. One long conveyor would not be as portable. It would be more difficult to adjust and handle and the shorter units can always be used to better advantage for general work about the plant.

An advantage of using the scoop conveyor to unload hopper bottom cars is the fact that no track hopper or pit is necessary. This makes it possible to unload cars at any point along the track. To unload a car, the scoop or feed end of the machine is placed near or under the car hopper. The hopper door is then released and the belt on the scoop conveyor carries the material away as fast as it flows through the hopper opening.

The construction details of the scoop conveyor have been described in the technical press. For information, address the manufacturers, The Portable Machinery Company, Passaic, N. J.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN FOUNDRYMEN'S ASSOCIATION

At the Annual Meeting of the American Foundrymen's Association to be held in Columbus, Ohio, October 4th to 8th, inclusive, a new department will be added to the program to be known as the NON-FERROUS CASTING SECTION. At the meetings of this section, papers and discussions of interest to the practical brass and aluminum foundrymen will be presented.

It is understood that the Institute of Metals Division of the American Institute of Mining & Metallurgical Engineers, will hold their convention in Columbus, during the same week, and it is proposed to have joint sessions of the Non-Ferrous Section of the A. F. A. and the Institute of Metals Division of the A. I. M. E. This announcement will be of interest to the more than two thousand manufacturers of non-ferrous castings in the United States and Canada.

Mr. C. S. Koch, president of the American Foundrymen's Association, has appointed Mr. Lucien W. Mueller of the H. Mueller Mfg. Co., Decatur, Ill., and Mr. Robert S. Archer of the Aluminum Manufactures, Inc., Cleveland, Ohio, as members of the papers committee to represent this new section.

THE INSTITUTE OF METALS

The Annual General Meeting of the Institute of Metals was held in the building of the Institution of Mechanical Engineers, Storey's Gate, Westminster, S. W., England, on March 11 and 12, 1920. The papers presented were as follows:

THURSDAY, MARCH 11

(1) Fifth Report to the Corrosion Research Committee. By G. D. Bengough, M. A., D. Sc., Member; R. M. Jones, M. Sc., and Ruth Pirret, B. Sc. (London).

(2) "The Action on Aluminum of Hard Industrial Waters." By Richard Seligman, Ph. D., Member, and Percy Williams, B. Sc., Member (London).

FRIDAY, MARCH 12

(3) "The Art of Casting in High Tensile Brass." By J. Neil MacLean (Glasgow).

(4) "The Removal of Internal Stress in 70:30 Brass by Low Temperature Annealing." By H. Moore, O. B. E., B. Sc., F. I. C., and S. Beckinsale, B. Sc., A. I. C (Woolwich).

(5) "Zinc Alloys with Aluminum and Copper." By W. Rosenhain, B. A., D. Sc., F. R. S., vice president; J. L. Haughton, M. Sc., Member, and Kathleen Bingham, B. Sc., Member (Teddington).

(6) "A Model for Representing the Constitution of Ternary Alloys." By W. Rosenhain, B. A., D. Sc., F. R. S., Vice President (Teddington).

(7) "Tin-Phosphorus Alloys." By A. C. Vivian, B. A., A. R. S. M., Member (London).

(8) "Some Notes on the Effect of Hydrogen on Copper." By W. C. Hothersall, M. Sc. Tech., and E. L. Rhead, M. Sc. Tech., Member (Manchester).

(9) "The Effect of Progressive Drawings upon Some Physical Properties of Commercially Pure Copper." By W. E. Alkins, M. Sc., Student Member (Manchester).

(10) "The Influence of Cold Rolling on the Physical Properties of Copper." By F. Johnson, M. Sc., Member (Birmingham).

(11) "The Study of Thermal Electro-motive Force as an Aid to the Investigation of the Constitution of Alloy Systems." By J. L. Haughton, M. Sc., Member (Teddington).

(12) Note on "The Polishing and Etching of Zinc for Micro-examination." By H. H. Hayes, Member (Birmingham).

(13) "Idiomorphic Crystals of Electro-deposited Copper." By W. E. Hughes, B. A., Member (London).

AMERICAN ELECTROPLATERS' SOCIETY

The Eighth National Convention of the American Electro Platers' Society will be held at the Seneca Hotel, Rochester, N. Y., on June 30, July 1, 2, and 3, 1920.

A strong educational program has been arranged; the list of speakers includes authorities of international reputation. All manufacturers, superintendents and others interested in keeping in touch with the progress that is being made in the science of electro-plating are invited to attend this convention. Because of the great educational value, it will pay every plant in the country to have their foreman plater attend.

The Rochester Branch is exerting every effort to make this the best convention, from every point of view, that the American Electro Platers' Society has ever held. An unusual program for entertainment has been arranged for visitors.

Special provision for women visitors is being made by the Ladies' Auxiliary of the Rochester Branch. Bring the ladies with you.

A later announcement will give full details of the program. But plan now to attend. For Rochester will not only make the convention decidedly worth while, from the practical standpoint, but also show you the time of your life. For information write to S. P. Gartland, 128 Bryan street, Rochester, N. Y.

NEWARK BRANCH

The second annual banquet was held at Achtel-Stetter's Banquet Hall, 842 Broad street, Newark, N. J., at 7:30 p. m., April 10, 1920. Members, their wives and guests were there to the number of over 170. There was a good menu, good music, good singing and good dancing. All agreed that they had had a wonderful time. The Banquet Committee were as follows: Horace H. Smith, chairman; Edward W. T. Faint, Charles Piske, Conrad Frey, Theo. Kreuter, O. F. Carlson, J. L. Merigold and C. E. Field.

PITTSBURGH BRANCH

The General Committee of the Pittsburgh Branch, A. E. S., are certainly enthusiastic over the encouraging response they are getting to their efforts towards creating the right kind of interest in their first birthday party.

It will be celebrated by a banquet at the Fort Pitt Hotel, Pittsburgh, on April 17th, at which a musical program will be rendered and speakers of note will be present. The souvenir menu is being well patronized by advertisers to help make the affair a success.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS

The Spring meeting of the National Association of Brass Manufacturers was held in the Red Room of the Hotel LaSalle on Thursday and Friday, March 18th and 19th, and was well attended and enthusiastic from start to finish.

Many matters of interest were taken up for discussion and disposition, among which might be mentioned the adoption of full Waterway Compression Stops on ½", ⅝" and ¾" size, hereafter to be made with full waterway and to be listed and sold with the list of their respective sizes.

It was also decided to incorporate all standards that have been adopted by this association, in co-operation with the National Screw Thread Bureau of Standards at Washington, to appear in the Official Catalog, which will make this edition so much more useful and attractive.

Additional delegates were appointed to the Trade Extension Bureau. Heretofore we have been represented by ex-President H. E. Speakman, but it was now decided to have three representatives on this bureau, on which will be represented both the high grade and competitive goods manufacturers.

The following hose thread dimensions have been finally adopted, which are also concurred in by the National Screw Thread Commission, Washington, D. C.

HOSE THREAD DIMENSIONS
(V Thread, not U. S. S.)

Male

Nominal Size	Threads per Inch	Outside Diameter Maximum	Outside Diameter Minimum
¾	11½	1.0625	1.0455
1	11½	1.2951	1.2781
1¼	11½	1.6399	1.6229
1½	11½	1.8788	1.8618
2	11½	2.3528	2.3358

Female

Nominal Size	Threads per Inch	Outside Diameter Maximum	Outside Diameter Minimum
¾	11½	1.0936	1.0788
1	11½	1.3262	1.3114
1¼	11½	1.6710	1.6562
1½	11½	1.9099	1.8951
2	11½	2.3839	2.3691

It was decided to eliminate entirely and discontinue the manufacture of No. 3615 Midget Pattern Basin Cock with stuffing boxes.

Another matter brought up for discussion was the question whether the word of "Hot" and "Cold" on indexed of plumbing fixtures was of real value or served any useful purpose. That was laid over to discuss at the next meeting as to whether the words "Hot" and "Cold" should not be eliminated entirely.

This opens up the further question of eliminating the entire china part, for to have a blank white china part would seem equally superfluous. Again it is very hard to obtain these at this time.

Association passed and endorsed military training resolution.

Elected Mr. R. B. Hills as representative to the National Committee and our Standardization Committee vice Mr. A. S. Hills, deceased—Mr. R. B. Hills filling an interim appointment made by the commissioner.

Many members volunteered to assist the Glauber Brass Manufacturing Company of Cleveland, Ohio, who are now having labor difficulties in their foundry.

The association re-affirmed its position of refusing to stamp names of customers on goods, the following analysis being made on this matter:

Total number for whom goods are stamped	54
Total in Eastern States (East of the Alleghenies)	21
Total in New England States	18
(Boston alone 12)	
Total in Central Western States	14
Total west of the Rockies	1

This summary shows that almost 75 per cent. of this service is rendered east of the Allegheny Mountains; 30 per cent. in New York and Boston and nearly 25 per cent. of the total in Boston alone.

The report of Commissioner Webster indicated that the association was in a most healthy condition financially and numerically was at its best, though the work that the association has been doing of standardizing goods and handling matters as indicated in the foregoing report should be an inspiration for every man in the brass business to rally to the standard of the association and do his part.

The guests of the association were: Thomas J. Nichol Company, Cincinnati, Ohio; Gibson Brothers, Waukegan, Ill.; Goetz Brass Works, Chicago, Ill.

Re-affirmed its position on the list of fine thread bibbs and any bibbs made with fine thread not listed in the catalog, the following should be added to such lists for fine thread:

⅜"	½"	⅝"	¾"	1"
1.20	1.20	1.80	2.40	3.60

The home office will send out a questionnaire for the present rate of wages on the six following trades: Speed Lathe, Polishers, Molders, Monitor Hands, Buffers, Core Makers, and the average of these given in piece and day work will be tabulated in zonified form and sent to all members participating in same.

After a very successful two-day session, the meeting adjourned to meet next in Cleveland, Ohio, some time in June, at a date to be fixed by the president and commissioner. Those who are interested can obtain information from W. M. Webster, commissioner, 1818 City Hall Square building, Chicago, Ill.

AMERICAN ELECTROCHEMICAL SOCIETY

The General Meeting of the American Electrochemical Society was held in Boston on April 8, 9 and 10, 1920. Headquarters were at the Copley Plaza Hotel. Among the papers presented were the following:

W. S. Landis: A New Cyanide.

F. C. Mathers and Stanley Sowder: Bronze Plating.

M. L. Hartman and O. A. Hougen: Physical Characteristics of Specialized Refractories. Part I. Spalling Losses.

M. L. Hartman and J. F. Kobler: Physical Characteristics of Specialized Refractories. Part II. Comparative Cold and Hot Abrasion Tests.

Symposium: Electrically produced alloys.

H. E. Howe: Fundamental Problems in Alloys Research.

Elwood Haynes: Stellite.

R. M Major: Nickel-chromium and Other Alloys.

Jos. W. Richards: The Söderberg Self-baking Continuous Electrode.

Clarence Jay West: The Electric Furnace as Applied to Metallurgy.

H. M. St. John: The Evolution of the Electric Brass Furnace.

NATIONAL VARNISH MANUFACTURERS ASSOCIATION

Plant managers of the New York and New Jersey Sections of the National Varnish Manufacturers' Association held their eighth meeting Thursday, March 18, at the New York Advertising Club, Mr. Frank M. Schumann of Hilo Varnish Corporation presiding.

The discussion on the subject of testing and controlling raw materials, manufacturing, and finished products proved very interesting.

The next meeting was held Thursday, April 15, and the subject was Cost Accounting.

NATIONAL ASSOCIATION OF WASTE MATERIAL DEALERS

At the meeting of the Metal Division held on Wednesday, March 17, 1920, L. D. Waixel, Union Smelting and Refining Company, Newark, N. J., was elected chairman for the year beginning March 24, 1920.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

James G. McCarty has been appointed manager of the Canadian Branch of the Metal and Thermit Corporation, of New York City. His headquarters will be in Toronto, Canada.

Robert L. Browne has been placed in charge of the sales in the New England States for the Metal and Thermit Corporation. His headquarters will be in Boston, Mass.

Edwin A. Oden, who for a number of years has been vice-president of the General Platers' Supply Company, New York, has organized The Oden Corporation of which he is president, with headquarters at Whitestone (Queens), New York City, to manufacture and handle platers' and polishers' supplies, chemicals and similar products.

R. C. Robinson, formerly with the J. W. Paxson Company, Philadelphia, Pa., has been appointed manager of the new Philadelphia Branch of the E. J. Woodison Company, of Detroit, Mich. His many friends, no doubt, will wish him well in his new undertaking.

Peter Peterson, Muskegon, Mich., has leased the plant of the Foote Axle Burr Company at Marshall, Mich., and plans to utilize the building for a brass and bronze foundry.

DEATHS

JOHN JEPPSON

Industrial Worcester received a severe blow in the death recently of John Jeppson, 75 years old, for more than 50 years identified with the grinding wheel and machine industry and many years with the Norton Company. His death occurred in Cuba, where he went the first of the winter, when not feeling well, with his son, George N. Jeppson. During his early life he worked at the pottery business. He was about 25 years old when he came to this country from Sweden. After working in New York for a time, he secured a position with F. B. Norton, who at that time was making pottery. He worked with Mr. Norton for five years, leaving to go to Taunton, where he worked for Wright & Son until 1877. Returning to this city after being at Portland, Me., for a time, he again entered Mr. Norton's employ. Norton, in the meantime, had been experimenting with a view of manufacturing grinding wheels, and Mr. Jeppson perfected a vitrified process for the wheels. He was one of the founders of the Norton Company.

WILLIAM J. BAILEY

William J. Bailey, head of the W. J. Bailey Company, 407 Mulberry street, Newark, N. J., died recently, following a lengthy illness, at 47 years of age. He was born in Verona, N. J. He learned the toolmaker's trade and later organized the Climax Manufacturing Company, and still later the W. J. Bailey Company, one of the largest gold and silver mesh bag manufacturing concerns in the country. During the war he utilized his plant for the manufacture of fuse caps and buttons.

He was an inventor of repute, inventing, among other things, several stamping machines. After the armistice was signed, Mr. Bailey began the manufacture of gold and silver purse frames. The deceased leaves a widow and two daughters.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

APRIL 6, 1920.

The 3,600 employees of the Ansonia factories of the American Brass Company who have been on strike since March 24, are still out and refuse to go back. Officials of the company are as firm in their unyielding attitude toward the employees' demands. Their wages have advanced in proportion to the increase in the cost of living, officials say. They are well paid, and their demands for further increases are unjust.

The American Brass Company is also having its troubles in Torrington. About 100 casters' helpers or tenders walked out this morning.. Although this is but a small part of the total number of employees, continued absence from work on the part of these men would eventually cripple the plant, if the company were not able to get others to take their places. The attitude of the company toward these strikers is the same as that toward those in Ansonia. They feel that they are sufficiently well paid and refuse flatly to grant their demands.

The first walk-out in Ansonia occurred on March 24, following several conferences with John A. Coe, president of the American Brass, and other officials, at which no agreement was reached. Practically the entire plant is shut down. An increase of 33⅓ cents for employees making under 60 cents an hour, and an increase of 25 cents for those making over 60 cents, with the 60-cent men included in the former class, are the demands of the employees. The entire strike has been conducted in an orderly fashion, with no hint of a recurrence of disturbances which occurred in the strike riots last June. Various meetings of the strikers have been held from time to time at each one of which it was voted not to go back to work. A large number of employees—around 600, it is claimed—have been leaving the city to seek employment in other places.

The casters' tenders in Torrington have petitioned the company for an increase of from 14 to 18 cents for pouring each pot of metal. They also ask that the casters do more of the work and not leave the bulk of it to them. A day's work is considered pouring 40 pots of metal, which would mean at the present wage paid, $5.60 a day. If the increase is granted, it would mean $1.60 a day more, or $7.20 a day.

The tenders work overtime on occasions and pour 50 pots, which would pay them, at the present price, $7 a day, and if the increase is granted, $9 a day. The casters, the tenders claim, get 22 cents for each pot poured, or $8.80 for 40 pots, and $11 a day when 50 pots are poured. The American Brass Company officials claim that the tenders' demands are unjust and will not be granted.

Whether labor troubles of Ansonia and Torrington will spread to Waterbury is not known yet. Apparently there is little dissatisfaction openly expressed here, although a large number of supernumerary policemen have been appointed in view of a recurrence of the June strike troubles.

Persistent rumors that the Waterbury Workers' Association would call a mass strike of all trades and crafts have been officially denied by the president of the association. An expression of friendship with the employers was made. The Waterbury Workers' Association is an independent organization of Waterbury workmen formed after the strike last June. Efforts to ally it with the American Federation of Labor so far have failed.

Unskilled and semi-skilled workers in Waterbury, members of Local No. 16,712, Federated Labor Union, however, have voted to submit a new wage scale demand to employers. They are after an eight-hour day and a day's pay instead of work by the piece method and the longer-hour day. Representatives of the A. F. of L. have been working here with this union. Waterbury manufacturers generally are strongly opposed to the recognition of the union.

Joseph W. Richards, professor of Metallurgy at Lehigh University and secretary of the American Chemical Society, addressed the Connecticut Valley branch of the American Chemical Society at a meeting on the modes of reduction and aduction of the different processes of electrolytic refining of metals. Prof. Richards has made a detailed study of metallurgy and the modes of reduction and aduction of the different metals. An interesting blackboard talk in which the processes were explained was followed by a number of stereopticon views.

The problem of discovering an unattackable anode in this process of refining metals is one of the biggest ones connected with the industry, said Prof. Richards. By such an anode metals may be extracted from the solution. Several anodes which are not as easily attacked are now used, though research work is bent on discovering one which does not become affected by acids employed in the process. The electrolysis of fused salts was explained with the different apparatus which was employed. The arc and resistance machinery in the electrothermal process were also explained.

By means of the stereopticon views, Prof. Richards showed how the Norwegians and Swedes obtained cheaper power to refine metals, especially steel. He also showed the advantages of a high mountain which has a large supply of "white coal," which could as easily be turned into powerful energy. The falls in Sweden are not so great as in Norway, though a large quantity of waterpower is utilized by both countries, in addition to that developed by fuel.

Following the lecture an inspection of the Scovill Manufacturing Company laboratories was made by those present at the gathering.

An unconfirmed rumor is afloat to the effect that the New Departure Company is contemplating a branch factory at Greystone.—D. H. P.

TORRINGTON, CONN.

April 12, 1920.

The casters' helpers, 116 in number, employed at the Coe Brass plant of the American Brass Company, presented a demand on April 1 for an increase in pay, the increase to be practically ten per cent.

The Torrington Company has had plans drawn for the erection of a six-story apartment block on its property on Main street, adjoining Conley's Inn. The Inn is conducted by the company.

The Purchasing Agents' Association of Connecticut at its annual meeting in New Haven elected the following officers: President, W. Percival Ogden, of the Scovill Manufacturing Company, Waterbury; first vice president, O. P. Palmer, Pratt & Whitney, Hartford; second vice president, F. V. Coville, Remington-U. M. C. Company, Bridgeport; treasurer, E. R. Lewis, Bradley & Hubbard Company, Meriden; secretary, H. G. Puffer, American Tube & Piping Company, Bridgeport. The executive committee is Henry Morrison, Bridgeport; A. L. Richmond, New Haven; James G. Couch, Waterbury, and D. W. Gammell, Hartford. The director of the Connecticut branch in the National Association of Purchasing Agents is J. E. Forgy of Bridgeport.

The question of whether or not daylight saving would be adopted in Torrington was still unsettled early this month. Most of the workers, it was reported, were strongly in favor of the plan. The Rotary Club and the Torrington Business Men's Association were pushing the movement.

Most of the Torrington factories were closed down from Thursday, April 1, until Monday, April 5, because of Good Friday and Easter occurring within that period.

The Fitzgerald Manufacturing Company has increased its capital stock from $250,000 to $500,000, the entire amount to be issued in shares of preferred stock at $100 par. The vote as passed was as follows:

"Voted, that the capital stock of this corporation be and hereby is increased by issuing in addition to the $100,000 of preferred stock now outstanding, 2,500 shares of 8 per cent, cumulative non-voting stock, preferred as to principal and interest, of the par value of $100 per share, redeemable at the option of the Fitzgerald Manufacturing Company at $115 per share."

The Winsted Manufacturers' Association at a meeting on March 30 indorsed daylight saving for that place.

Frederick L. Braman of the Coe Brass Branch, Charles H. Alvord of the Hendey Machine Company and F. J. Damon of the Union Hardware Company were among the delegates from Torrington to the Republican State convention held last month.

The factory baseball league has elected the following officers: President, Charles M. Brimble; vice president, E. C. Murdick; secretary, Charles H. Oberdick, and treasurer, Einer Palm.

An indication of the benefits of prohibition is the fact that an arrest for intoxication here on March 22 was the first arrest on that charge to be made in Torrington since January 1. In the "wet" days, two or three arrests for intoxication in a single day were not unusual.

Considerable impetus has been given to the Americanization Movement in Torrington during the past several months. The manufacturers are taking a keen interest in the work. At a meeting held during the latter part of last month, a central Americanization committee was formed. James H. Graham of the Torrington Company and Robert B. Thursfield of the Coe Brass Branch of the American Brass Company represent the manufacturers on this committee. The personnel also includes Henry G. Ellis, of the Torrington Manufacturing Company, who is a member by virtue of his office as warden, and Charles H. Alvord, of the Hendey Machine Company, who is chairman of the town school committee. Edward H. Hotchkiss, of the Hotchkiss Brothers Company, was chairman of the committee which selected the central organization.

BRIDGEPORT, CONN.

April 12, 1920.

The taking over of the Remington Arms plant by the General Electric Company is of the greatest interest to the metal trades of this city. The factory is one of the most up-to-date plants in this section of the country, and during the war was used for the construction of Browning machine guns, officers' automatic revolvers, bayonets for the English and American armies, and before this country entered the war was used for the manufacture of repeating rifles for the Russian government.

It is understood that small motors will be manufactured in Bridgeport and that the opening of the factory will not in any way curtail the working force at the other plants of the General Electric in Schenectady, Pittsfield or elsewhere.

Bridgeport loses its only typewriter factory when the Remington-Yost factory moves to Flushing, Long Island. This factory has been making the Yost Typewriter for over twenty years at its plant here, and several years ago the Remington Typewriter Company bought out the patents and plant and have continued to make the Yost machine here. This Yost is in great demand in England and France, where most of the machines are sold. About a month ago the Remington company bought the factory of the Nathan company in Flushing and are now moving to the new location. About 1,000 men are employed at the local factory and most of these will go to Flushing if the company can provide housing.

The Yost factory, which is across the street from the Columbia Graphophone Company, has been bought by the Graphophone company, who intend to make extensive alterations and build large additional factories to provide for their constantly increasing business.

The officers of the association for the coming year were elected at the meeting held in the Garde Hotel, New Haven, on March 31.

W. B. Ogden, of the Scoville Manufacturing Company, Waterbury, was elected president; O. P. Palmer, of the American Machine Company, Hartford, first vice-president; F. V. Arville, Remington Arms Company, Bridgeport, second vice-president; E. P. Lewis, of the Bradley & Hubbard Manufacturing Company, Meriden, treasurer; P. G. Puffer, American Tube & Stamping Company, Bridgeport, secretary.

PHILADELPHIA

April 12, 1920.

Operations in many of the local metal working plants have been retarded considerably in recent months by the accumulated transportation tie-ups. The builders of larger machinery have been short of iron and coke for foundry purposes, and delays of other materials, both raw and semi-finished, have held back deliveries on orders. While labor is somewhat insufficient in some of the higher skilled trades, it is fairly plentiful in the majority of lines of work.

With the launching of the ninety-eighth ship last week at the Hog Island yard of the American International Shipbuilding Corporation, a world shipbuilding record was established. The deadweight tonnage launched within twenty months totals 611,575 tons, or one vessel every twenty-nine working hours, and one delivered every thirty hours. The figures issued by the management show that 59,065,781 rivets have been driven in the hulls, and 336,662 tons of steel plates and shapes erected. The eighty-three cargo carriers delivered to the Shipping Board have received the highest rating of the American Bureau of Shipping, while fifty of the vessels also received the highest classification from Lloyd's Bureau. The Quistoonok, the first ship turned out at Hog Island, has a record of 60,000 miles steamed.

March was another busy month at the Philadelphia mint, the output reaching a total of 16,933,000 pieces of domestic coinage, with a value of $1,317,110, and 5,325,000 pieces for the Republic of Cuba. For home use the coinage consisted of 592,000 half dollars, 168,000 quarters, 5,050,000 dimes, and 9,611,000 pennies. For Cuba there were made 325,000 silver and 5,000,000 nickel pieces.

The Gerhab & Ludlam Company has been chartered, with a capitalization of $150,000, to manufacture metal parts for wagons, trucks, etc., in Philadelphia. The incorporators are Alexander W. Gerhab, 1718 Tioga street, Philadelphia; Howard W. Ludlam, Haddonfield, N. J., and Jonathan L. Grubb, North Glenside, Pa.

The Wade Manufacturing Company, Camden, N. J., has been incorporated, with a capitalization of $150,000, to manufacture spark plugs. The incorporators are Walter S. and Frank E. Wade, and Frank H. Ryan.

The precision Grinding Wheel Company has awarded the contract for its two-story concrete and steel extension, which will cost about $100,000 with equipment.

The Victor Metal Company, Westmoreland street, near Richmond, is planning a one-story extension, 28 x 50 feet.

The Electric Storage Battery Company, Nineteenth street and Allegheny avenue, has acquired 40 acres of ground near its present plant for extensions.

The Merchant & Evans Company, 2035 Washington avenue, tin plate specialties manufacturers, has bought a site of 12 acres at Lancaster, Pa., on which a new branch plant will be erected.

The Sun Shipbuilding Company, Chester, Pa., is planning improvements, including a 600-ft. drydock, three additional shipways, a wet-dock, 200 x 600 ft. and new shop buildings, all of which are to cost about $3,000,000. Work will start this month and some of the extensions will be ready for service next autumn.

DETROIT, MICH.

APRIL 12, 1920.

Car shortage and scarcity of coal have been features during the month to cause more or less anxiety among Detroit copper, brass and aluminum manufacturers. The coal situation, however, has cleared up, but the car shortage still is quite acute and just how much longer it will continue to hamper no one can tell. Furthermore, it is difficult to obtain deliveries of raw material, although thus far there has been no serious inconvenience. Such conditions are expected under present conditions and manufacturers as a rule are patient and doing their best to keep up production notwithstanding their handicaps.

Regarding the automobile industry, it is the same old story. Orders so many that manufacturers have trouble filling them. This condition has been prevalent for many months and probably will be for many months to come. Increased production seems to be the aim of all the plants in the city and the surrounding suburbs.

Labor conditions were never better than at present. There are no strikes and none seem to be in prospect. There is, however, a shortage of skilled and also unskilled workmen. Owing to scarcity of moderate priced houses it is reported somewhat difficult to get labor to come to Detroit. No relief is in sight in this regard because building has slowed down owing to the almost prohibitive costs.

The Michigan Securities Commission has notified the General Aluminum & Brass Manufacturing Company, of Detroit, that its application for approval of a new preferred stock increase of $1,200,000 has been granted, together with the privilege of selling its entire capital issue of $4,500,000 in the state. A balance sheet showing the company's condition as of Dec. 31, 1919, before giving effect to the new issue of preferred stock, has been filed with the secretary of the Detroit Stock Exchange. Current assets are listed at $1,870,290.04 and current liabilities at $1,185,773.47. The company's net worth, including of course its plant account, is placed at $1,798,686.75, represented by $697,720 common stock, $165,770 preferred stock and $935,196.75 surplus.

At a recent meeting of the Chicago Stove and Range Company, with headquarters in Benton Harbor, Mich., the name was changed to the Benton Harbor Castings Company. At the same time stockholders approved the plan of erecting a building 80 x 200 feet which, when completed, will practically double the capacity of the plant. The cost is estimated about $30,000, which will be taken care of, it is said, by the sale of that amount of preferred stock. The following officers were elected: President, F. L. Bradford; vice president, E. C. Bowlby; secretary, H. S. Gray; treasurer, J. B. Kovar; general manager, J. N. Klock.

The Brass and Aluminum Foundry Company, at Goodells, Mich., has started operations with a force of about fifty men. The company is reported to have a year's contract with a concern in Pontiac, Mich.

The Traub Manufacturing Company, manufacturing jewelers, has been incorporated for $250,000. Those interested are William Traub, Robert C. J. Traub and Ernest E. Bross, all of them Detroit men.

The Michigan Motor Parts Corporation, also of Detroit, has recently been incorporated for $100,000, for the purpose of manufacturing and dealing in automobile engines, motors, auto parts, accessories and a general machine and manufacturing business. Those interested are Burton H. Warner, 207 Pallister avenue, Detroit, and William J. Baird and Otto H. Siewek, also of Detroit

F. J. H.

ROCHESTER, N. Y.

APRIL 12, 1920.

Despite the fact that every manufacturing plant in this city is crowded with orders and is turning out goods to its fullest capacity, the handicap of poor freight and express shipping facilities is a menace that greatly disturbs.

Owing to a shortage of supplies, at a recent meeting of the purchasing agents of the various manufacturing plants of the city, the suggestion of the loaning of certain metals to one another was discussed. Of course, all of the larger plants carry large stocks of supplies in their warehouses, and it was the idea of drawing on the surplus stocks—say of brass, copper, or aluminum—in order to prevent the shutting down of some factory through a lack of some particular material that led to the meeting of the purchasing agents' organization. While the agents did not announce the results of the conference, it is generally understood that an arrangement or agreement was arrived at.

There is no change in the metal situation in Rochester. The demand is strong for all kinds, particularly brass, copper, aluminum and tin-plate, and prices have undergone no perceptible change. In many cases orders have been given subject to delivery three to four months hence. An improvement, however, is expected in due season. Labor in all of the big metal-using plants seems to be satisfied at this time, and no suggestion of disturbance is apparent now. This is a situation much appreciated by the manufacturers as well as the public.

The electro-platers' organization in Rochester is working on plans for the annual convention of the American Electroplaters' Society, which is to be held here on June 30 and July 1, 2 and 3. A ladies' auxiliary has been organized and is preparing ways for the entertainment of the wives of delegates who will attend the convention. It is said that the headquarters of the electroplaters will be at the Hotel Seneca, and the convention proper may be held at that hotel. However, Convention Hall is available and may be utilized. Four hundred delegates are expected.—G. B. E.

ROME, N. Y.

APRIL 12, 1920.

Never in the history of the metal industry shops of this city has business been better or more promising than at the present time. Additions and enlargements are being made to several of the plants, and this is in addition to a considerable number of new buildings which were put up during the period of the war.

The working conditions and hours in the Rome metal industry shops compare favorably with any in the country. Practically all plants are on an eight-hour basis at top-notch wages.

At Riverdale Club, the recreation center of the metal industry factories, wholesome activities know no end. Everything from wrestling matches to dancing parties, educational classes and bowling tournaments form an almost continuous program at that popular center. Plans for an industrial baseball league have been completed, and the various teams, representing the employees of the brass and copper plants of the city, will very shortly be taking the field for preliminary practice. It seems to be a settled matter with the managements of the several shops in this city that a due amount of recreation has a great deal to do with production, and that the old adage, "All work and no play makes Jack a dull boy," is as true today as ever. The manufacturers here are seeing to it that "Jack" is not a dull boy when the world is calling for production.

The annual meeting of the stockholders of the Rome Manufacturing Company was held at the office of the company. The following directors were elected: W. B. Johnson, Barton Haselton, P. C. Thomas, E. L. Spriggs, C. P. Drake, Joseph M. Read, A. F. Carpenter. The inspectors of election were W. W. Parry and H. J. Rowland. At a subsequent meeting of the directors the following officers were elected: Chairman of the board, W. B. Johnson; president, P. C. Thomas; vice-president, Barton Haselton; vice-president, E. L. Spriggs; secretary-treasurer, C. P. Drake; assistant secretary and sales manager of the locomotive department, A. T. Whyte; executive committee, W. B. Johnson, P. C. Thomas, Barton Haselton, C. P. Drake.

At the annual meeting of the Rome Electrical Company the following directors were elected: N. H. Jones, W. W. Parry, John S. Baker, James A. Spargo and George A. Clyde. At a subsequent meeting of the directors, officers were elected as follows: President, N. H. Jones; vice-president, W. W. Parry; secretary and treasurer, George A. Clyde.—M. J. D.

WORCESTER, MASS.

April 12, 1920.

Shortage of steel, the raw material, and a scarcity of skilled help, are things which are causing manufacturers of metal products in this city not a little concern. All of the factories are running full tilt, however, and many of them have orders for many months ahead.

Worcester is to have one of the new Winchester Arms Company's chain of hardware stores. The company has just closed negotiations for a lease of one of the best business blocks in Worcester, at Harrington Corner, directly opposite City Hall, and will occupy the ground floor of the store, leasing the other floors to concerns in other lines of business. The rental per year, it is said, for the entire block is $80,000, and the lease is to run for a term of 10 years.

The force of the O. S. Walker Company, manufacturers of grinding machinery, has been joined by Howard E. Tracy, prominently known as a mechanical engineer, with machine design as his specialty. He is to be head of the engineering department of the company. Mr. Tracy comes to Worcester from Winchendon, where he has been on the engineering staff of the Baxter D. Whitney Company, builders of woodworking machinery, also grinding machinery.

A demand for the products of the Coppus Engineering Company from all parts of the country is keeping that company rushed. The business serves as an accurate barometer of general industrial conditions, for when the demand for the blowers they manufacture is great, it is because manufacturers throughout the country are striving to get the greatest possible power from their boilers, and when the demand falls off, it is because the owners of the mills and factories are no longer interested in securing maximum results in the way of production.—W. J. B.

MILWAUKEE, WIS.

April 12, 1920.

Wisconsin's industrial development is being retarded to a serious extent by the lack of adequate housing facilities for employes of its manufacturing plants. The problem has become so acute that many of the largest concerns have abandoned expansion plans to permit home building to catch up with new factory construction. The Milwaukee Association of Commerce has taken steps to remedy the situation by urging its membership, which includes all the metal producing industries in the city, to suspend building of new plants and additions until there are again enough homes to provide for the workers already employed.

An unusual and fatal accident at the main plant of the Aluminum Goods Manufacturing Company at Manitowoc early in the month, caused a loss of thousands of dollars and six lives, when dust and gas contained in the blower pipe tank in the buffing department exploded. The blast occurred in a new building in which 2,000 workers mostly women, were employed. An investigation conducted by the state industrial commission cleared the company, which is the largest producer of aluminum cooking utensils in the world, of any blame.

The explosion was found to have resulted from friction caused by a foreign wire entangled in the blower pipe fan. The wire was declared to have been pushed into the building from the outside. It had been wound about the fan until the friction ignited the gas. The pipe in which the flames started leads from the buffing and polishing machines to the tank into which dust and gas are drawn.

The Simmons Company of Kenosha, manufacturers of metal beds, has begun carrying out an expansion program which will include the erection of new factories and warehouses in many parts of the country.

CLEVELAND, OHIO

April 12, 1920.

Something of a slowing down in activities in metal industry establishments in this territory is noted in the last few weeks, although with the turn of the month into April a revival of buying interest generally in manufacture is seen. There is a feeling among manufacturing interests generally in this vicinity that the peak of prices has been reached, and that with a possibility of a return to more normal and saner levels, there is less disposition to turn out production at this time.

The labor situation is believed to be more influential, however, than anything that may develop in the general demand. In the larger manufacturing plants disturbances are more in evidence, and this rather than uncertainty of outlet for its product, from automobiles down to the small items, is having a slowing influence. On the other hand, smaller plants find their business on the upgrade, and with fewer men there is less unrest. Hence these establishments are going ahead with production, and find the market as eager for their products as ever.

Chief note to optimism in this locality is seen in the larger number of plans for expansion than in any single month in the last half year. Among the first to be in operation early in April is the Gardner-Bryan Company's new plant at 1876 East 18th street, where a three-story building on a plot 120 by 40 feet has been acquired, and where double the output of taps, dies, gages and screw plates will be possible over the old downtown location. Before the summer double the operating staff will be at work. More than 50 men will be employed on each floor. Officers of the Gardner-Bryan Company include: President, John M. Gardner; vice-president, C. E. Gardner; secretary-treasurer, R. H. Smart. Mr. Smart is well known in the east, having been identified for fifteen years with the Greenfield (Mass.) Tap and Die Company, where he was sales manager of the small tool department.

One of the newest concerns to enter the copper and brass branch of the metal industry in this territory is the Parish-Pool Company, which is about to enter the smelting and refining of metals activity here. Through unique processes this company proposes to refine its product from scrap metal. The company is now erecting a plant, said to be the third largest plant of its kind in this country, at Clinton Road and Big Four tracks. It will use electric furnaces in its operations. Initial production capacity will be 75 tons a day. Object of locating in this district is the claim that 50 per cent of the copper and brass production of the United States is made within 200 miles radius of Cleveland proper. In addition to reclaiming brass and copper, the Parish-Pool Company also plans to reclaim aluminum, zinc, lead, pewter and solder. It will ship its product in ingots and billets. The process is the invention of Ralph R. Parish, who is vice-president and general manager of the company. Other officers include: President, E. I. Heinsohn; vice-president, Edward A. Noll; secretary, Lloyd H. Pool; treasurer, R. H. York, all identified with the United States Copper Products Corporation, or similar interests. Temporary headquarters have been established at 1118 Guardian Building.

One indication of labor disturbances here made itself felt in this branch of manufacture in the walkout of about 1,000 employees at the plant of the Parish & Bingham Company, making automobile parts. The workers demanded more liberal working arrangements, according to H. L. Enos, general superintendent. In a few days practically all walkers out were back at work.

In contrast to this condition is the announcement of the formation of an employees congress at the Reliable Stove Company division of the American Stove Company. This congress recently voted itself an increase of 11 per cent in wages, following investigation of working conditions among those employees in the metal working plants of this district. Through this arrangement these employees have been told they are receiving the highest wages in this section in the metal working industry.

And still another step toward closer co-operation between the firm and its workers is revealed this month in preparations to open a roof garden atop the main building at the plant of the Globe Machine and Stamping Company. Here walks, flowerbeds, trees, fountains, statues, a conservatory and an observatory have been created. There is also a vegetable garden. According to A. F. Schroeder, president of the company, it is the only garden of its kind in the United States. There are at present 500 employees at the Globe.

COLUMBUS, OHIO

April 12, 1920.

The metal market in Columbus and central Ohio territory has been more active during the past month. Manufacturing concerns are buying better, as some of the uncertainty in the trade

is past. But the large number of the purchasers are buying only for the present and are loath to accumulate stocks under present conditions. The tone of the trade is slightly better than formerly, with brighter prospects for an active trade in the future.

One of the worst features of the trade is the slowness in receiving shipments due to car shortage and congestion on railroads. Embargoes are announced from time to time that hold up shipments in certain directions and the entire result is demoralizing to the trade.

Copper is in fair demand, with prices unchanged from the previous month. Lake is selling in the neighborhood of 19½ to 19¾ cents. Brass is moving fairly well, around 17½ to 18 cents for red and 14½ to 15 cents for yellow. There is a fair demand for aluminum at former levels. More strength is displayed in both lead and tin. Spelter is selling quite well, and there is also a good demand for zinc. Type metals are very firm and are selling probably better than any other variety of metals. Activity continues in the printing business which causes a good demand for type metals.

The Security Metal Products Company, of Cincinnati, has been incorporated, with a capital of $100,000, by W. P. Anderson, V. L. Moeser, G. W. Mallon, S. C. Donahue and H. M. Howard.

Papers have been filed increasing the authorized capital of the Regent Brass Foundry Company, of Marysville, from $15,000 to $100,000.

The Trojan Brass Manufacturing Company, of Cincinnati, has been chartered, with a capital of $50,000, by J. Luebbe, L. Luebbe, R. Luebbe, A. Schreck and W. B. Hillebrand.

The Washington Metal Products Company, of Washington, C. H., O., has been incorporated, with a capital of $50,000, by J. D. Boone, P. S. Horton, E. R. Bales, J. F. Goebel and W. A. Lubbers

The Aluminum Spinning Products Company, of Dayton, Ohio, has been chartered, with a capital of $10,000, by L. Miller, E. Wilcke, H. E. Kritzer, J. Schoettinger and C. A. Boehringer.

J. W. I.

TRENTON, N. J.

April 12, 1920.

Although there will be plenty of building during the coming Summer considerable of the work is going to be held up because of the high wages of labor and the soaring prices of material. Only building that is really necessary will be erected and those who want to take a chance at speculating by building homes will find that it will require large sums to carry on the work. Trenton, like many other cities, is now facing a housing crisis and many hundred new homes are needed. On top of this condition comes the wage question, with labor taking advantage of the scarcity and demanding higher wages. The union bricklayers and plasterers, who are now receiving $1 an hour, recently presented new demands to the bosses asking that $1.25 be the hourly scale. The bosses wanted certain contracts finished at the old scale, and the journeymen finally consented to withdraw the demands.

A bill was recently passed by the New Jersey Legislature which will be of benefit to workmen who happen to lose their positions suddenly. The bill requires the payment within twenty-four hours of wages due a discharged employee from a factory. Formerly discharged employees were compelled to wait until the next pay day for their wages.

The daylight saving law caused some confusion after it had been adopted by New York State and certain parts of New Jersey. A number of Trenton jewelers set their clocks ahead and many factory employees reported to work at the new time. The majority of workmen who hustled to work an hour too soon were foreigners who had been misinformed by others. The employers of the Trenton plants favor the daylight saving law, as it gives them a good chance to look after home gardens. The Trenton manufacturers are also in favor of the law and have hopes that New Jersey will adopt it.

The Trenton metal plants continue busy and expect a good Spring and Summer. The Ingersoll-Trenton Watch Company has awarded a contract to S. W. Mather & Sons for the erection of a one-story brick addition to the factory on Monmouth street, to cost $3,500. The company recently engaged a number of young women for the different departments. The company is operating fifty hours a week with a Saturday half holiday. Charles A. Schreed & Son engaged some metal die makers. An aluminum concern situated near New York City recently sent a representative to Trenton in the hopes of engaging polishers and buffers. The concern announced that it was impossible to secure the needed help in that section.

The plant of the Trenton Emblem Company, situated at 120 Hamilton avenue, was damaged by fire during the past month and for a time the entire works was threatened with destruction. The fire started when one of the sunken furnaces where metals are treated became overheated and ignited plies of lumber. The flames were eating their way through the first floor to the second when the firemen arrived. Mechanics were put to work immediately repairing the damaged building. The concern manufactures metal emblems.

Karl G. Roebling, president of the John A. Roebling's Sons Company, and Robert K. Bowman, of the Jordan L. Mott Company, have been made members of the advisory committee to raise $35,000 for the Trenton Welfare Association, an organization to look after the poor and needy.

The Board of Assessment of Burlington County has increased the assessment of $851,000 on the Roebling, N. J., plant of the John A. Roebling's Sons Company. The plant is now assessed at $2,330,000. This does not include the big Roebling plant at Trenton. The Keystone Watch Case Company, of Riverside, N. J., is this year assessed at $288,000. The Riverside Metal Company is assessed at $60,000, an increase of $70,000 on the two plants.

Karl G. Roebling, president of the John A. Roebling's Sons Company, has returned from an extensive trip through the south. He was accompanied by his family.

The strike of the moulders delayed work for several days at the plant of the J. L. Mott Company and other Trenton concerns. The moulders asked for another increase in pay with the same working conditions, and the Trenton concerns refused to grant the demands. A walkout followed and the works were unable to turn out products. The concerns declare that they will not grant the demands and have so notified the unions. The plants affected are the J. L. Mott Company, John E. Thropp & Sons Company, William R. Thropp Company and the Duncan Mackenzie Company.

The employees of the Ingersoll-Trenton Watch Company were recently organized into a branch of the International Jewelry and Watchmakers' Union. At a meeting held recently the following officers were elected: President, Lewis W. Homer vice president, Albert Campbell; recording secretary, Miss Grace Lawton; financial secretary, Raymond E. Snook; treasurer, Miss May Kearney; corresponding secretary, Mrs. Julia Gray; sergeant-at-arms, Harry Gunkel; warden, F. Schraeder; trustees, George Burd, L. Levenstein and Edward Moran; delegates to Central Labor Union, Miss Mabel Lockwood, Albert Campbell and Raymond E. Snook.

A. Wallach & Company have leased a portion of a loft building at 11-15 Runyon street, Newark, N. J., for the manufacture of various kinds of jewelry.

The E. Behringer Sheet Metal Works, Inc., located in New York City for the past fifty years, has purchased a property on Jabez street, Newark, N. J., for the manufacture of sheet metal products. The new property is two stories, 125 by 100 feet.

The New Jersey Tip Top Ash Can Company, of Newark, N. J., has been incorporated with $10,000 capital stock to manufacture and deal in ash cans. The incorporators are Samuel Kibbel, H. A. Augenblick and Samuel Kurland, all of Newark.

LOUISVILLE, KY.

April 12, 1920.

Louisville sheet copper and tube working houses report a quiet demand, the general demand in sheet metals of the higher grades being quiet. However, some of these houses are breaking into side lines of sheet iron work, which is enabling them to keep fairly busy. The copper and brass casting shops are especially busy, and report that they are well behind on orders, and receiving more business than they can well take care of.

There has never been a time in the history of the big machine and metal working trades when general demand has been any heavier than it is at this time. The Henry Vogt Machine Company, one of the largest machinery houses of the district, reports that every department is working at capacity, and that no

early delivery business can be accepted. This house is manufacturing boilers, gray iron castings, drop forgings, refiners' equipment, refrigerating machinery, etc. There is a heavy demand for pumps, which is keeping the Vogt Brothers Manufacturing Company and other local pump houses going at capacity, the Grainger Company being especially busy at this time.

The Independent Brass Works is operating at full capacity on a day and night shift basis in order to take care of demand, and is still well behind on deliveries.

Hines & Ritchey report that the plant is running at capacity, and having considerable work done on the outside in supplying equipment for its allied company, the Standard Milk Machinery Company.

E. E. Sherman, of the Vendome Copper & Brass Company, reported that while demand for sheet metal work in copper was dull, there was a heavy demand for sheet iron work. The company's subsidiary, Kleinsteuber & Young, is working at full speed on sheet iron work.

The raw material markets are cleaned up, and much trouble is experienced in getting shipments of sheet copper and brass. Tubes are in better supply.

Announcement has been made by the Louisville Pattern Works, which has changed its name to the Louisville Pattern & Engineering Company.

The Aluminum Company of America, Pittsburgh and Mascot, Tenn., has completed plans for installation of a new aluminum plate works at Mascot, Tenn.

The Kentucky Switch & Signal Company, large consumers of copper and brass castings, used in electrical switches, has incorporated with a capital of $16,000, to take over the business of the Cheatham switch interests.

A nice deposit of lead sulphite has recently been discovered in Barren County, near Glasgow, samples having been sent to Washington and reported as good.

The Peerless Manufacturing Company, Louisville, is in the market for several punch presses for stamping, blanking, drawing and forming. Harry Venable is superintendent. The company is at Fifteen and Ormsby avenue.

The John Isert Company, Louisville, capital $20,000, to manufacture sheet metal goods, has been incorporated by John H. Isert and others, and will equip a plant.

Full-time operations are being handled at the main shops of the Louisville & Nashville R.R., at Louisville, where car repairs are running extremely heavy.

Labor conditions in Louisville are somewhat easier, as a result of employers having beaten a strike of thirteen building trades unions, which contended for the closed shop plan. They were out ten days.

The United States Tinfoil Company, Louisville, has purchased machinery for a large addition to the old Reynolds Corporation tinfoil plant in Louisville, and is more than doubling the capacity.

The New Albany Machine Manufacturing Company, after five years in a leased plant, has purchased the building and property. It owns all of the equipment. It plans to enlarge its plant.

BIRMINGHAM, ENGLAND

APRIL 5, 1920.

The metal industries of the country, and particularly those of the Birmingham district, played a very important, perhaps the most important part in the British Industries Fair, which was held in London, Birmingham and Glasgow from February 23 to March 5. There has never been at any time so large and so representative a collection of the products of the British hardware industries as was to be seen in the buildings of the Aerodrome at Castle Bromwich, six miles from Birmingham, which had been lent by the Air Ministry to the Birmingham local committee.

One of the most notable displays was that arranged by the Cold Rolled Brass and Copper Association, the Brass Wire Association, the Brazed Brass Tubes Association, the Brass and Copper Tubes Association, and the Nickel Silver Association. There were some seventy firms taking part in this exposition of the possibilities of the metal industry. Leeds, Sheffield, Swansea, Coventry, Bristol, Manchester and Stoke-on-Trent, were represented, but the great majority were Birmingham firms. Cold rolled articles in copper and brass alloys included sheets, strip, tape, and a variety of other products were exhibited and there were also samples of rolled sheets in all sizes and gauges. The Brass Wire Association collection included not only wire and the various articles made from it, but also strip in a variety of sections for ornamental and other purposes and turbine blades, with the strips from which they are cut. Every variety of tubes was exhibited and there were some interesting illustrations of the possibilities of solid drawing in the shape of considerable lengths of small tubing. The nickel silver manufacturers provided an exhibit of spoon, fork, and other blanks for the electroplater, pattern wire used for beading and other decorative purposes and drawn and spun work.

Side by side with this collection was the exhibit of the Association of Drop Forgers and Stampers. This association was formed two or three years ago and embraces some eighty representatives of the trade throughout Great Britain. One of its activities is the periodical meeting for the reading and discussion of papers. The specimens exhibited ranged from surgical instruments and calculating machine parts to motor car and ship work forging. Hardly any metal working or engineering industry failed to find representatives among the work of the drop forgers. In the non-ferrous metal industries, drop forging and stamping have come into increasing use during the last two or three years. Forging and stamping methods commend themselves in view of the fact that the number of wasters is reduced to a minimum. Particular interest was evinced in the stampings in yellow metal. In the past such stampings were not in favor, but improved practice has resulted in their being brought more generally into use. The homogeneity of the alloy is now so perfect that defects in stampings are almost unknown, whilst in the after jigging and machining of the parts, a stamping has great advantages. In the hall, which contained these collections, there were many other exhibits showing the progress made in metal working processes. In another large building, chiefly devoted to cycles and motor and aircraft parts and accessories, there were some very interesting exhibits of melting and heating furnaces and molding and finishing machinery.

Foreign visitors found a special attraction in the hall set apart for the exhibition of finished goods. Gas and electrical fittings and heating appliances using gas, oil or electricity, occupied the greater portion of the space. There was also an exceptionally fine display of aluminum hollow-ware, for the manufacture of which Birmingham has become the leading centre. In addition to hollow-ware for domestic use, local firms are making vessels of large capacity for the brewing, confectionery, jam, chemical, and other trades in which the acid resisting properties of aluminum are of value. In this country copper is being rapidly superseded by aluminum for these and many other purposes, including the large kitchen utensils used in hotels and ocean steamers. Practically the only Birmingham trade not represented in the exhibition was electro-plating. This formed one of the sections at the London part of the fair which was held in the Crystal Palace.

Good business for early delivery was done with Canada, particularly in aluminum hollow-ware. New Zealand merchants enquired for many lines in hardware, metal furniture, sprayers, etc. South Africa showed an interest in various departments and particularly in motor cycles. The Scandinavian countries and Holland were good buyers, especially of engineering tools. From nearly all countries, including Italy, South America, and the Far East, hollow-ware, aluminum, galvanized and enameled, was in great request. Estimates of the business placed at the three sections of the fair run to £5,000,000 or £6,000,000, and, although no definite statistics have been published, there is no doubt that the metal trades, especially those represented at Birmingham, have obtained a full share of the total.

By the general desire of the exhibitors it has been decided to continue the fair in coming years. The Aerodrome buildings at Castle Bromwich will be available in 1921 and 1922, the Air Ministry having decided to make a stipulation to that effect in any lease of the building. It is reported that negotiations are in progress for the occupancy of the Aerodrome by a large engineering combine.

NON-FERROUS METAL RESEARCH IN GREAT BRITAIN

The British Non-Ferrous Metals Research Association has now been formally incorporated as a limited company not for profit and firms throughout the metal trade are being invited to join. Non-British firms will be excluded from membership. The members of the association will pay an annual subscription based upon the capital employed in each business. Where the

firm is partly engaged in other than non-ferrous metal work, the subscription will be specially assessed. The minimum annual subscription will be £25 and the maximum for the first yeat £200. The Government, out of the £1,000,000 set aside for the encouragement of industrial research, will contribute an amount equal to annual subscription list.

The association will organize research for the benefit of all the non-ferrous metal industries, including copper, brass, zinc, aluminum, gold, silver, etc. Research in the early stages will be given to the more urgent needs of the industry. At the outset, at any rate, the association will not set up its own laboratory, but will work through the laboratories of the universities and other existing institutions. There is already in Birmingham a Brass and Copper Castings Research Laboratory, which, under the direction of Professor T. Turner, has for the last two years been investigating the production of sound ingots. The work and equipment of this laboratory will be taken over.

An important part of the work will be that of the Information Bureau. This will have its headquarters in Birmingham, but it is hoped later to establish branches in other centres. A librarian has been appointed, and a beginning has been made in the filing and indexing of material.

VERIFIED NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The **Acme Aluminum and Brass Works,** 420 South Harding street, Indianapolis, Ind., is having plans prepared for the construction of a factory. Estimated cost, $70,000.

The Roessler & Hasslacher Chemical Company have moved their main office to more commodious quarters at 709 Sixth avenue, corner of Forty-first street, New York.

The Cleveland Branch of **Innis, Speiden & Company, Inc.,** moved to its new location, 1913 Orange avenue, on April 1, 1920. They carry a full line of industrial and plating chemicals.

The Metropole Plating Works have moved from 162 East Twenty-second street, New York City, to 77 Wallabout street, Brooklyn, N. Y.

The **Brown Instrument Company,** Philadelphia, Pa., is erecting two new buildings, at a cost of $100,000; one for the manufacture of recording thermometers, the other for a research department.

Warren Products Company, Inc., has found that its increasing business has again made it necessary to move to larger quarters. Since March 31, 1920, they have been at 261 Canal Street, New York City.

The General Aluminum & Brass Manufacturing Company, Detroit, Mich., is issuing 10,000 shares of 8 per cent. cumulative preferred stock, par value $100. This stock is free from the Normal Income Tax, and exempt from Michigan taxes.

The **Dixie Brass & Foundry Company,** Sixth Ave., Birmingham, Ala., will build a plant and install cupola, crane, etc. Charles Wegelin is manager. They operate smelting and refining departments, brass, bronze and aluminum foundry and casting shop.

The **Pioneer Metal Goods Corporation,** New York, recently incorporated, with $250,000 capital stock, by P. Wurtz, J. Hamber, and W. M. Messersmith, 25 Broad street, will manufacture metal specialties. They will operate a die-casting shop, plating and polishing departments.

The E. J. Woodison Company have taken a ten years' lease on an entire city block, located at Thirty-third and Thirty-fourth streets, between Oakford and Gray's Ferry Road, Philadelphia. This gives them a large siding directly on the Pennsylvania tracks.

The **Yorkville Manufacturing Company, Inc.,** Brooklyn, N. Y., manufacturers of sheepskin polishing wheels, leather meal for tumbling barrels and other leather products used in the metal lines, announce their removal from 273 Lorimer street to 31-33-35 Broadway.

The **Hoffman Electroplating Company,** formerly of Carlstadt, N. J., has removed to 109 Water street, Paterson, N. J., where they have an enlarged plant, with an area of 2,000 sq. ft., equipped with modern facilities to do all kinds of plating and polishing, also japanning.

The **Midwest Brass and Copper Company, Inc.,** have moved to new and larger quarters at 480 Broome street, New York City. The additional space will be used to carry a full line of brass and copper in rods, tubes, sheets and wire for immediate shipment.

The **Shawinigan Foundries, Ltd.,** Shawinigan Falls, Quebec, Canada, have acquired the electric furnace plant of Braser Brace & Co. Additions to the plant are under contemplation, and arrangements are being made for carrying on brass foundry work. G. G. McCartney is president.

The **Buffalo Porcelain and Enameling Company,** Buffalo, N. Y., are building a one-story concrete plant at 1927 Elmwood avenue that will cost, with equipment, between sixty and seventy-five thousand dollars. They make enameled products on sheet steel and cast iron, using the vitreous process.

The Detroit Electric Furnace Company, Detroit, Mich., have sold a second 2,000-pound furnace to the General Aluminum & Brass Manufacturing Company of Detroit, making a total of two furnaces of this size at this plant. They have also sold a 1,000-pound furnace for export to France, to be used in the plant of Schneider & Company.

The **J. W. Westwood Foundry Company,** 1405 Division avenue, S. Grand Rapids, Mich., are building a foundry on Mt. Vernon avenue and Fulton street, where they will cast a general line of aluminum castings, but specializing in match plates, patterns and core boxes. It will be 40 x 50 ft. They expect to occupy it by April 15. They will be in the market for equipment in the near future.

The **Gartley Weston Company** and the Doherty Metal Plating Company, both of Detroit, Mich., have amalgamated and will carry on business under the name of the Gartley Weston Company, with a capital of $300,000. The Doherty company has a factory with 35,000 ft. floor space. The concern will be one of the largest of its kind in the country. They handle silver, nickel, copper and brass, and plate, polish and lacquer.

The **Sandusky Foundry and Machine Company** of Sandusky, Ohio, casters of metals by the Millspaugh centrifugal process, announce that the new officers of their company are as follows: W. H. Millspaugh, president; W. C. Boyle, vice-president, and L. A. Stroh, treasurer. These officers and Josiah Macey include the board of directors. Irving A. Brown is no longer connected with the company.

The **Alemite Die Casting & Manufacturing Company,** 341 West Chicago avenue, Chicago, has purchased a site, 437 x 570 ft., at Washtenaw and Belmont avenues, and will build a $400,000 plant of one- and two-story buildings, to have a floor space of 100,000 sq. ft., and will employ 1,000 men. They operate smelting and refining departments, brass, bronze and aluminum foundry, brass machine shop, tool room, soldering, plating and polishing departments.

F. N. Simpson, director of **A. Simpson & Son, Ltd.,** Adelaide, South Australia, who is about to visit the United States, will purchase bedstead plant and sheet-metal machinery. This company manufactures bedsteads, and is probably one of the largest manufacturers of tin ware and enameled hollow ware in Australia. He will leave that country in January and may be reached care of the Bank of Adelaide, 11 Leadenhall street, London, England.

The organizations of **Westinghouse, Church, Kerr & Company, Inc.,** engineers and constructors, New York, and **Dwight P. Robinson & Company, Inc.,** constructing and consulting engineers, of New York, have combined. The new company will occupy executive offices at 61 Broadway, and engineering and designing offices in the Grand Central Palace, 125 East Forty-sixth street, New York City. Dwight P. Robinson, president of the new company, was for many years president of the Stone & Webster Engineering Corporation, and formed his own company in 1918.

The new **International Chamber of Commerce,** projected at the International Trade Conference at Atlantic City last October, will be formally organized, it is announced by the Chamber of Commerce of the United States, at Paris during the week of June 21, 1920. Invitations have been sent out by the American group of the International Organization Committee to business and industrial associations, asking them to name delegates to participate in the organization meeting. About 100 American delegates are expected to attend.

TRADE PUBLICATIONS

Soldering Zinc.—A compilation of information by The New Jersey Zinc Company, 160 Front street, New York. It embodies several details that the metal artisan will undoubtedly find of value in this work. These hints have been prepared by the Zinc company's rolled-zinc division to satisfy numerous requests for information on this subject. Those who desire a copy may secure one by writing the sales department.

A page circular on **"Hecla,"** which the makers say has for 35 years stood every definite standard for anti-friction bronze, has just been issued by Thomas Paulson & Son, Inc., 97 Second avenue, Brooklyn, N. Y., makers of brass, bronze and aluminum castings. Among other prints issued by this company are pretty monthly calendars.

Copper, Brass Tubes & Rods, Etc.—A new bulletin issued by the Standard Underground Cable Company, Pittsburgh, Pa., which includes price lists, weights, sizes, and various useful tables of information.

Electric Wires and Cables.—A catalogue issued by the Rome Wire Company, Rome, N. Y., including price lists and useful information pertaining to bare and insulated wires for electrical purposes.

The Official Catalogue of National Association of Brass Manufacturers has been delayed by the trouble in securing paper. They have at last secured the necessary material and hope to send it to all those who have ordered the catalogues at a very early date; in the meantime the publication will not be retarded one moment unnecessarily, and the delay met with thus far has been with the paper mills, entirely beyond any control.

METAL STOCK MARKET QUOTATIONS

	Par.	Bid.	Asked.
Aluminum Company of America	$100	$525	$550-650
American Brass	100	220	223-226
American Hardware Corp.	100	157	140-145
Bristol Brass	25	34	28-33
International Silver, com.	100	30	35
International Silver, pfd.	100	92	98-101
New Jersey Zinc	100	240	294-298
Rome Brass & Copper	100	280	295-330
Scovill Mfg. Co.	100	400	425-435
Yale & Towne Mfg. Co.	...	250	265-280

Corrected by J. K. Rice, Jr., & Co., 26 Wall Street, New York.

METAL MARKET REVIEW

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE

Domestic consumers of copper purchased quite freely during the second half of March for shipment over the second quarter of the year and a few orders were taken by smaller producers for shipment during July and August at steadily advancing prices. Today the market is again quiet but prices are fully 1c. a pound higher than a month ago, electrolytic being sold at 19¼ delivered for April, May and June shipment and at 19½ delivered for third quarter shipment. According to conservative interests American producers succeeded in booking contracts for 325,000,000 pounds in March, most of which was taken in the second half of the month. It is estimated that about 50,000,000 pounds of the total was sold for export. It will be recalled that sales in January amounted to about 250,000,000 pounds, followed by a lull in February when sales were scarcely more than 125,000,000 pounds but with the March transactions, the total for the first quarter of the year was fully 700,000,000 pounds.

Speculators were mainly interested in far off positions, especially third and fourth quarters, and even consuming interests, convinced of the solidity of the market, were desirous of purchasing for third and even fourth quarter shipment but producing interests discouraged any purchases beyond August. More recently, however, producers have taken business for the full third quarter. Today prices in the open market are ¼ to ½c. a pound above producers' asking prices, third quarter electrolytic being salable at 19¼ to 19¾c. a pound, and fourth quarter at 19¾ to 20c. a pound f. o. b. refinery.

The interest of the entire industry was excited late in March by a statement given out by John D. Ryan indicating that the world's consumption of copper in 1919 was 2,970,000,000 pounds which would mean an average monthly consumption of 247,500,000 pounds a month. As the United States is the largest consumer, as well as producer of copper, and its consumptive requirements last year did not average over 100,000,000 pounds a month, the Ryan statement would mean that the rest of the world, leaving out Central Europe and Russia, consumed at the rate of 147,500,000 pounds a month in 1919. This seems almost incredible as under normal conditions, Europe and Japan together do not consume more than 90,000,000 pounds a month, and with scarcity of coal and labor difficulties throughout Europe, consumption of copper is rather below than above normal. The prospect, however, is for improvement in melting if political difficulties now looming over the horizon abroad do not check industrial activities.

The main feature of interest at home, however, is that consumption is enormous, estimated at 130,000,000 pounds a month. Since the first of January, output of refined copper in this country from domestic and foreign material is estimated at 425,000,000 pounds and home deliveries and exports have amounted to 530,000,000 pounds. It is thus evident that consumption is at a greater rate than production which means that surplus stocks are being reduced. It is these facts that have added strength to the position of the copper producers.

In the last few days trade was again dull.

TIN.

Deliveries of tin into domestic consumption during March amounted to 5,130 tons, of which 230 tons were from Pacific ports, the remainder being 4,900 tons from Atlantic ports. The total supply available was 8,043 tons. Stocks, at the end of the month, were 2,848 tons of which 923 tons were in store and 1,925 tons were on dock or landing. Cargoes afloat amounted to 2,315 tons making total visible American supply on March 31, of 5,163 tons. Invisible supplies in the hands of consumers, also are large; consequently, no anxiety exists in the trade as to possible shortage. This gives confidence and enables buyers to take advantage of any reaction in the market instead of hurrying to buy on rising prices. Fluctuations were frequent, covering a range of 5c. per pound from the highest prices, 64c. on March 11, to the lowest figures 59c., at which Straits was available on March 18 and again on March 25. The net result of changes was an advance of ¼c. per pound, when on March 31, Straits was selling at 62.50c. as compared with 62.25c. at the beginning of the month. American pure tin at the end of March was selling at ¼c. per pound less than Straits and 99 per cent tin was available at 61.62½c. as compared with prices March 1, of 61.75c. for American pure and 61.50c. for 99 per cent metal, making the net rise ½c. on American pure and ¼c. on 99 per cent tin.

ZINC.

A large volume of business in zinc has been transacted since last report, the buying having been not only on foreign account but on domestic account, as well. Brass manufacturers and galvanizers were heard from more frequently than for a long time, indicating the better conditions developing in those trades. Export business, however, continued to be the main support of the Zinc market as has been the case for many months. Prices declined in sympathy with the London market on March 17, to 8.40-8.50c. East St. Louis, 8.75-8.85c. New York. Two days later, with higher rates for Sterling and an advance in London prices, a recovery was made to 8.75c. East St. Louis, 9.10c. New York, the March opening price. On the succeeding days, domestic buying failed to sustain prices which by March 25, were down to 8.35-8.40c. East St. Louis, 8.70-8.75c. New York, the lowest of the month. In the closing week, brass special and grade A were in frequent demand and this combined with foreign buying again carried prices upward, quotations at the end of the month being 8.65c. East St. Louis, 9.00c. New York for all positions prime Western. Brass special was

held at 8.80c. The net decline amounted to only 10 points, but fluctuations covered a range of 55 points.

LEAD.

An easier tone developed in the lead market during latter half of March but prices of the leading interest were unchanged at 9.00-9.25c. East St. Louis, and New York, respectively. In the outside market, however, prices after having been maintained at 9.00-9.10c. East St. Louis, 9.50c. New York, since March 8, for prompt metal, on March 17, declined to 8.87½-9.00c. East St. Louis, 9.00-9.12½c. New York. The Western price declined another ⅛c. on March 19, there being larger supplies at that point. By March 25, a further decline, due to increasing supplies, carried to 8.75c. East St. Louis, 9.00c. New York, there being no further change until April 1, when 5 points off at St. Louis carried to 8.70c. New York price was unchanged at 9.00c.

ALUMINUM.

Producer's prices of aluminum remained unchanged at 33c. for virgin, 31.50c. for No. 12 and 44.20c. for sheet 18 gauge and heavier throughout March. In the outside market, prices, also were stationary at 31-32c. for Virgin 98-99 per cent at 30.50-31.50c. for remelted 98-99 per cent and 29-30c. for No. 12 remelted. Supplies, at the beginning of March, were ample, but with arrivals being delivered largely on contract, not much of such material became available in the open market. Thus, the ingot market remained strong, sales being made at 31.50c. New York, 32c. Detroit. An interesting feature was the active demand for sheet from special industries, automobile makers and manufacturers of kitchen utensils. Urgency of buyers in these industries combined with scarcity of supplies in sheet, carried prices in special instances in the open market to as high as 65-75c. per pound, which was paid to a few independent producers who had stocks available. The Aluminum Company of America, however, maintained its basis at 44.20c. throughout the month, making deliveries only to regular customers on contract.

ANTIMONY.

Large arrivals of antimony in March resulted in such an addition to already accumulated stocks that pressure to sell brought about a decline of 1⅛c. per pound, by the end of the month, from 11.62½c. to 10.50c. per pound for prompt wholesale deliveries, duty paid, New York. Jobbing business, as usual was done at about ⅛c. per pound more than wholesale.

SILVER.

Fluctuations in prices of bar silver, in March, covered a range of 15c. per ounce, from the highest point March 2 at $1.32 to the lowest $1.17 on March 12. The net decline, however, was only 5¼c. from $1.31¾ at the beginning to $1.26½ at the end of March. Bar silver, at an estimated value of $250,000,000 was received from London, in first half of March, which was derived from the surplus of the melted continental coinage put on the London market, at a time when the narrow limits of the English market was unable to absorb it.

QUICKSILVER

Prices of quicksilver declined because of increased supplies to $86 per flask by March 8. Stocks, however, were so quickly diminished that prices, by March 10, had recovered, the advance carrying to $95 per flask on March 22. By April 1, the quotation was $103 per flask of 75 pounds.

PLATINUM.

The price of platinum, in March, after declining from $155 per ounce to $135 on March 12, was advanced later in the month, to $142, this price prevailing over the remainder of the month. While demand has not decreased supplies are more plentiful. On April 6 platinum prices had fallen to $133 per ounce.

OLD METALS.

Conditions in old metals were improved in the latter part of March, when the future outlook became optimistic because of increased demand and higher prices for copper in the major market. Between March 5 and 12, there were declines ranging from ½c. to 1c. per pound on various items but by the end of the month, recoveries were ¼c. on light copper to 14.25c., ½c. each on composition turnings to 14.25c., and on composition scrap to 16c. Aluminums were up to 26.50c. for clippings, to 24c. for old cast and to 23.50c. for sheet. The weak feature was lead, concerning which there was some uneasiness due to the continued decline in the major market.

WATERBURY AVERAGE

Lake Copper. Average for 1919, 19.55. 1920—January, 19.25. February, 19.125.—March, 18.875.

Brass Mill Zinc. Average for 1919, 8. 1920—January, 9.75. February, 9.40.—March, 9.15.

MARCH MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
Copper:			
Lake	19.25	18.50	18.869
Electrolytic	19.00	18.00	18.358
Casting	18.50	17.75	18.114
Tin	64.00	59c	61.989
Lead	9.50	9c	9.261
Zinc (brass special)	9.05	8.55	8.769
Antimony	11,62½	10.50	10.967
Aluminum	33.00	31.00	31.50
Quicksilver (per flask)	$95.00	$86.00	$91.13
Silver (cts. per oz.)	132	117	125.55

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities, which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metal, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. page.

Metal Prices, April 12, 1920

NEW METALS

	Cents.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER.	
Manufactured 5 per centum.	
Electrolytic, carload lots	18 75-19.25
Lake, carload lots	19.25-19.50
Casting, carload lots	18⅛-18⅝
TIN—Duty Free.	
Straits or Australian, carload lots	62.25
LEAD—Duty Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots	9.00-9.25
ZINC—Duty 15%.	
Brass Special	8.80-8.90
Prime Western, carload lots	8.70-8.80
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½c. per lb.	
Small lots, f. o. b. factory	....
100-lb. f. o. b. factory	....
Ton lots, f. o. b. factory	31-33
ANTIMONY—Duty 10%.	
Cookson's, Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot	10.62½
NICKEL—Duty Ingot, 10%. Sheet, strip, strip and wire, 20% ad valorem.	
Ingot	43.00
Shot	43.00
ELECTROLYTIC	45.00
MANGANESE METAL	Nominal
MAGNESIUM METAL—Duty 20% ad valorem (100 lb. lots)	$1.60-$1.85
BISMUTH—Duty free	Nominal $2.50
CADMIUM—Duty free	Nominal $1.40
CHROMIUM METAL—Duty free	Nominal
COBALT—97% pure	$2.50-$3.00
QUICKSILVER—Duty 10% per flask of 75 pounds	$103.00
PLATINUM—Duty free, per ounce	$133.00
SILVER—Government assay—Duty free, per ounce	$1.23
GOLD—Duty free, per ounce	$20.67

Metal Prices, April 12, 1920

INGOT METALS

Silicon Copper, 10%	according	to	quantity	49	to55
Silicon Copper, 20%	"	"	"	36	to40
Phosphor Copper, guaranteed 15%	"	"	"	26	to33
Phosphor Copper, guaranteed 10%	"	"	"	25	to32
Manganese Copper, 30%	"	"	"	65	to72
Phosphor Tin, guarantee 5%	"	"	"	75	to78
Phosphor, Tin, no guarantee	"	"	"	70	to75
Brass Ingot, Yellow	"	"	"	15	to16½
Brass Ingot, Red	"	"	"	20	to23
Bronze Ingot	"	"	"	20	to25
Parsons Manganese Bronze Ingots	"	"	"	22½	to24
Manganese Bronze Castings	"	"	"	32	to42
Manganese Bronze Ingots	"	"	"	19	to23
Manganese Bronze Forgings	"	"	"	30	to40
Phosphor Bronze	"	"	"	24	to30
Casting Aluminum Alloys	"	"	"	32	to34

OLD METALS

Buying Prices.		Selling Prices.
16½to17½	Heavy Cut Copper	18 to18½
16 to16½	Copper Wire	17½to18
14½to15	Light Copper	16½to17
16 to16½	Heavy Machine Comp.	17½to18
11½to12	Heavy Brass	12½to13
9 to 9½	Light Brass	10½to11
9 to 9½	No. 1 Yellow Brass Turnings	11 to11½
14 to14½	No. 1 Comp. Turnings	16 to16½
4.25	Heavy Lead	4.90
4.25	Zinc Scrap	5.00
10 to13	Scrap Aluminum Turnings	11 to14
21 to23	Scrap Aluminum, cast alloyed	23.50to25
24.00	Scrap Aluminum, sheet (new)	26.50
36.00	No. 1 Pewter	40.00
18.00	Old Nickel anodes	20.00
26 to28	Old Nickel	30 to32

BRASS MATERIAL—MILL SHIPMENTS

In effect January 7, 1920.

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.25¼	$0.27¼	$0.29
Wire	.25¼	.27¼	.29
Rod	.23¾	.28	.30
Brazed tubing	.37	..	.41¾
Open seam tubing	.37	..	.41¾
Angles and channels	.38	..	.42¾

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.26¼	$0.28½	$0.30¼
Wire	.26½	.28½	.30¼
Rod	.25	.29¼	.31¼
Brazed tubing	.38¼	..	.43
Open seam tubing	.38¼	..	.43
Angles and channels	.39¼	..	.44

SEAMLESS TUBING

Brass, 30½c. to 32½c. per lb. base.
Copper, 32c. to 34c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	29½c.	net	base
Muntz or Yellow Metal Sheating (14"x48")	25¾c.	"	"
Muntz or Yellow Rectangular Sheets other than Sheathing	26¼c.	"	"
Muntz or Yellow Metal Rod	23¼c.	"	"

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	29½c. net base
From stock	31½c.-34c. net base

BARE COPPER WIRE—CARLOAD LOTS

22¾c. to 23¼c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	31½c. per lb. base
100 lbs. to 300 lbs. in one order	32½c. " " "

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 12½c. basis, less 8 per cent.

Casks, jobbers' prices	14c.
Open casks, jobbers' prices	14½c.

ALUMINUM SHEET AND ROD

Sheet Aluminum, base price, 52c. per lb. Coils 48c. per lb.

ROD.

B. & S. Gauge.

¾" to 1" Advancing by 32nds
1" to 2⅝" " " 16ths } 98% rolled, 43.10 cents per lb.
2⅝" to 3½" " " 8ths

⅜" to ¾", 98% rolled and drawn.....48.80 cents per lb.

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c., over 25 to 50 lbs., 17c. over, less than 25 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 2c. over N. Y. tin price, 100 lbs. or more, 5c. over Pig Tin. 50 to 100 lbs., 12c. over, 25 to 50 lbs., 15c. over, less than 25 lbs., 25c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

LEAD FOIL

Base price—figured on base price of lead at the time.

PLATERS' METALS

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 1.26 to 1.29 per Troy ounce, depending upon quantity.

Rolled sterling silver, $1.20 to $1.23.

NICKEL ANODES

85 to 87% purity	.55c.	per lb.
90 to 92% "	.57½c.	per lb.
95 to 97% "	.60c.	per lb

Supply Prices, April 12, 1920

CHEMICALS

Acid—		
Boric (Boracic) Crystals	lb.	.25
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.04
Hydrochloric, C. P., 20 deg., Carboys	lb.	.10
Hydrofluoric, 30%	lb.	.40
Nitric, 36 deg. Carboys	100 lb.	7.28
Nitric, 42 deg., Carboys	100 lb.	7.90
Sulphuric, 66 deg., Carboys	lb.	.03½
Alcohol—		
Denatured	gal.	1.35
Alum—		
Lump, Barrels	lb.	.05½
Powdered, Barrels	lb.	07.
Aluminum sulphate, commercial tech	lb.	.15
Aluminum chloride solution	lb.	.16
Ammonium—		
Sulphate, tech., Barrels	lb.	.07
Sulphocyanide	lb.	—
Argols, white, see Cream of Tartar	lb.	.80
Arsenic, white, Kegs	lb.	.15
Asphaltum	lb.	.35
Benzol, pure	gal.	.65
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.10½
Calcium Carbonate (Precipitated Chalk)	lb.	.15
Carbon Bisulphide, Drums	lb.	.08
Chrome Green	lb.	—
Cobalt Chloride	lb.	2.00
Copper—		
Acetate	lb.	.60
Carbonate, Barrels	lb.	.29
Cyanide	lb.	1.00
Sulphate, Barrels	lb.	.09
Copperas (Iron Sulphate, bbl.)	lb.	.04
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.80
Crocus	lb.	.15
Dextrin	lb.	.25
Emery Flour	lb.	.10
Flint, powdered	ton	—
Fluor-spar (Calcic fluoride)	ton	—
Fusel Oil	gal.	5.50
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	—
Shellac	lb.	—
Iron, Sulphate, see Copperas, bbl	lb.	.04
Lead Acetate (Sugar of Lead)	lb.	.25
Yellow Oxide (Litharge)	lb.	.25
Mercury Bichloride (Corrosive Sublimate)	lb.	1.92
Nickel—		
Carbonate Dry	lb.	.80
Chloride, 100 lb. lots	lb.	.65
Salts, single, bbl.	lb.	.17
Salts, double, bbl.	lb.	.15
Paraffin	lb.	.25
Phosphorus—Duty free, according to quality		40-45
Potash, Caustic, Electrolytic 88-92%, fused	lb.	.32
Electrolytic 70-75%, fused	lb.	.26
Potassium Bichromate, Casks	lb.	.40
Carbonate, 80-85%	lb.	.25
Cyanide, 98-99½%, 100 lb. cases	lb.	.24
Pumice, ground, bbls.	lb.	.05
Quartz, powdered	ton	—
Official	oz.	—
Rosin, bbls.	lb.	.08½
Rouge, nickel, 100 lb. lots	lb.	.40
Silver and Gold	lb.	.60
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.18
Sal Soda	lb.	—
Silver Chloride, dry	oz.	1.43
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.81½
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—		
Biborate, see Borax, bbls	lb.	.10½
Bisulphite, tech.	lb.	.07
Cyanide, 96 to 98%, 100 lbs	lb.	.28
Hydrate (Caustic Soda)	lb.	.15
Hyposulphite, 100 lb. lots	lb.	.03¾
Nitrate, tech., bags	lb.	.06
Phosphate	lb.	.05
Silicate (Water Glass) bbls	lb.	.03
Sulpho Cyanide	lb.	.90
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.25
Sulphur (Brimstone) bbls.	lb.	.03
Tin, Chloride	lb.	.65
Tripoli Composition	lb.	.02½
Verdigris, see Copper Acetate	lb.	.60
Water Glass, see Sodium Silicate, bbls	lb.	.03
Wax—		
Bees, white ref. bleached	lb.	—
Yellow	lb.	.60
Whiting	lb.	.05
Zinc., Carbonate, bbls.	lb.	.24
Chloride, 600 lb lots	lb.	.15
Cyanide	lb.	.45
Sulphate, 100 lb. cases	lb.	.06

COTTON BUFFS

Open buffs, per 100 sections (nominal).		
12 inch, 20 ply, 64/68, cloth	base,	$108.15
14 " 20 " 64/68, "	"	134.50
12 " 20 " 84/92, "	"	143.30
14 " 20 " 84/92, "	"	193.05
Sewed buffs, per pound		
Bleached and unbleached	"	.90

FELT WHEELS

			Price Per Lb.
White Spanish—			
Diameter— 6" to over 16"	Thickness—½" and ¾"		$4.00
" 6" and 8"	" 1" to 3"		3.35
" 10" to 16"	" 1" to 3"		3.25
" over 16"	" 1" to 3"		3.35
" 6" to over 16"	" over 3"		3.40
Grey Mexican—			
Diameter— 6" to over 16"	Thickness—½" and ¾"		$3.90
" 6" and 8"	" 1" to 3"		3.25
" 10" to 16"	" 1" to 3"		3.15
" over 16"	" 1" to 3"		3.25
" 6" to over 16"	" over 3"		3.30

Above are even diameters, Odd diameters 50c advance.